PACKAGE engineering

Getting specifications that work

Ten points deserving attention when balancing too-liberal and too-strict requirements to get dual-purpose general (applying to all containers of a class) and specific (for a particular container) packaging specifications. (See Page 33)

Shortcuts to more accurate filling

How to get peak performance from a piston filler by attention to component wear and preventive maintenance—through mechanical factors (machine parts, functions) and process conditions (problems with product). (See Page 37)

Economic aspects of packaging decisions

Showing just how to make an economic evaluation as a guide in picking a project for profit and in making packaging equipment decisions—from the viewpoint of a packaging engineer facing fiscal, technical questions. (See Page 54)

Complete table of contents on Page 2

AUGUST 1960

VOLUME 5 • NUMBER 8

Stockings don't walk away...when "pilfer-proof" wrapped by Scandia

Retailers welcome the security of Scandia's unique method of folding and sealing cellophane overwraps on hosiery boxes.

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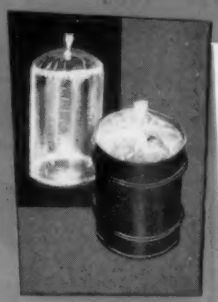

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For your calendar

August 15-19. AMA workshop seminar on package development and engineering:
Colgate University, Hamilton, New York. Contact: John L. Wood, packaging coordinator, American Management Association, 1515 Broadway, New York 36, N.Y. *Telephone:JUdson 6-8100.*

September 14. Packaging Institute professional member seminar on folding cartons:
Drake Hotel, Chicago, Ill. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, N.Y. *Telephone: MUrray Hill 7-8875.*

September 20-21. Research and Development Associates military-industry conference:
Stock Yard Inn, Chicago. Contact: Col. R. A. Isker, secretary, Research and Development Associates, QM Food and Container Institute, 1819 W. Pershing Road, Chicago 9, Ill. *Telephone: LAfayette 3-5500, ext. 4262 or 4267.*

September 21-23. AMA workshop seminar on packaging costs and controls:
Hotel Astor, New York, N.Y. Contact: John L. Wood, packaging coordinator, American Management Association, 1515 Broadway, New York 36, N.Y. *Telephone: JUdson 6-8100.*

September 25-30. University of California's 2nd annual packaging, plant layout and material handling short course:
UCLA Conference Center, Lake Arrowhead, Calif. Contact: Engineering Extension, Room 6266G, Engineering Building, Unit II, University of California, Los Angeles 24, Calif. *Telephone: GRanite 3-0971, ext. 9877.*

September 28. Packaging Institute professional member seminar on resins:
Statler-Hilton Hotel, New York, N.Y. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, N.Y. *Telephone: MUrray Hill 7-8875.*

October 31-November 2. Packaging Institute 22nd Annual National Packaging Forum:
Statler-Hilton Hotel, New York, N.Y. Contact: Charles A. Feld, executive director, Packaging Institute, 342 Madison Avenue, New York 17, N.Y. *Telephone: MUrray Hill 7-8875.*

October 31-November 4. AMA packaging management course:
Hotel Astor, New York, N.Y. Contact: John L. Wood, packaging coordinator, American Management Association, 1515 Broadway, New York 36, N.Y. *Telephone: JUdson 6-8100.*

1961: November 7-10. Packaging Machinery Manufacturers Institute Show of 1961:
Cobo Hall, Detroit. Contact: W. L. Redding, Hanson & Shea, Inc., One Gateway Center, Pittsburgh 22, Pa. *Telephone:ATlantic 1-8552.*

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PACKAGE engineering

AN ANGUS J. RAY PUBLICATION

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37 **Factors affecting accuracy of vertical piston fillers,** by Joseph T. Stigler, Manager, Filler Product Engineering, The Pfaudler Company, Division of Pfaudler Permutit, Inc.
Suggests preventive measures and remedies for common mechanical problems; stresses importance of proper valve and piston for a given product type.

42 **Effect of packaging on palatability of frozen turkey fryer-roasters,** by J. D. Winter, Shirley Trantanella, and Milo H. Swanson, Institute of Agriculture, University of Minnesota, and W. B. Ackart, Union Carbide Plastics Company
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54 **Pick your projects for profit—using economic evaluation,** by Edward M. Krech, Jr., Winton Hill Technical Center, The Procter & Gamble Company
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62 **Don't overlook the value of medium-speed packaging,** by David B. Sabine, Assistant to the Vice President, U.S. Vitamin & Pharmaceutical Corporation
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70 **Packaging machines cause mechanical stresses in flexible materials,** by H.-E. Roder, Farbwerke Hoechst A.G., Frankfurt, Germany, and Rudolf Heiss and G. Schricker, Institute for Food Technology & Packaging, Munich, Germany
Part II, describing bottom folding in bag machines, bag and closure folding in automatic machines, and defining "pliability factor" of a material.

84 **Practical pointers to better folding carton performance:** Part V—Developing articulate, workable specifications
Weighing pro's and con's of "material" type spec's as compared to "performance" type; pointing out importance of tailoring spec's to individual needs.

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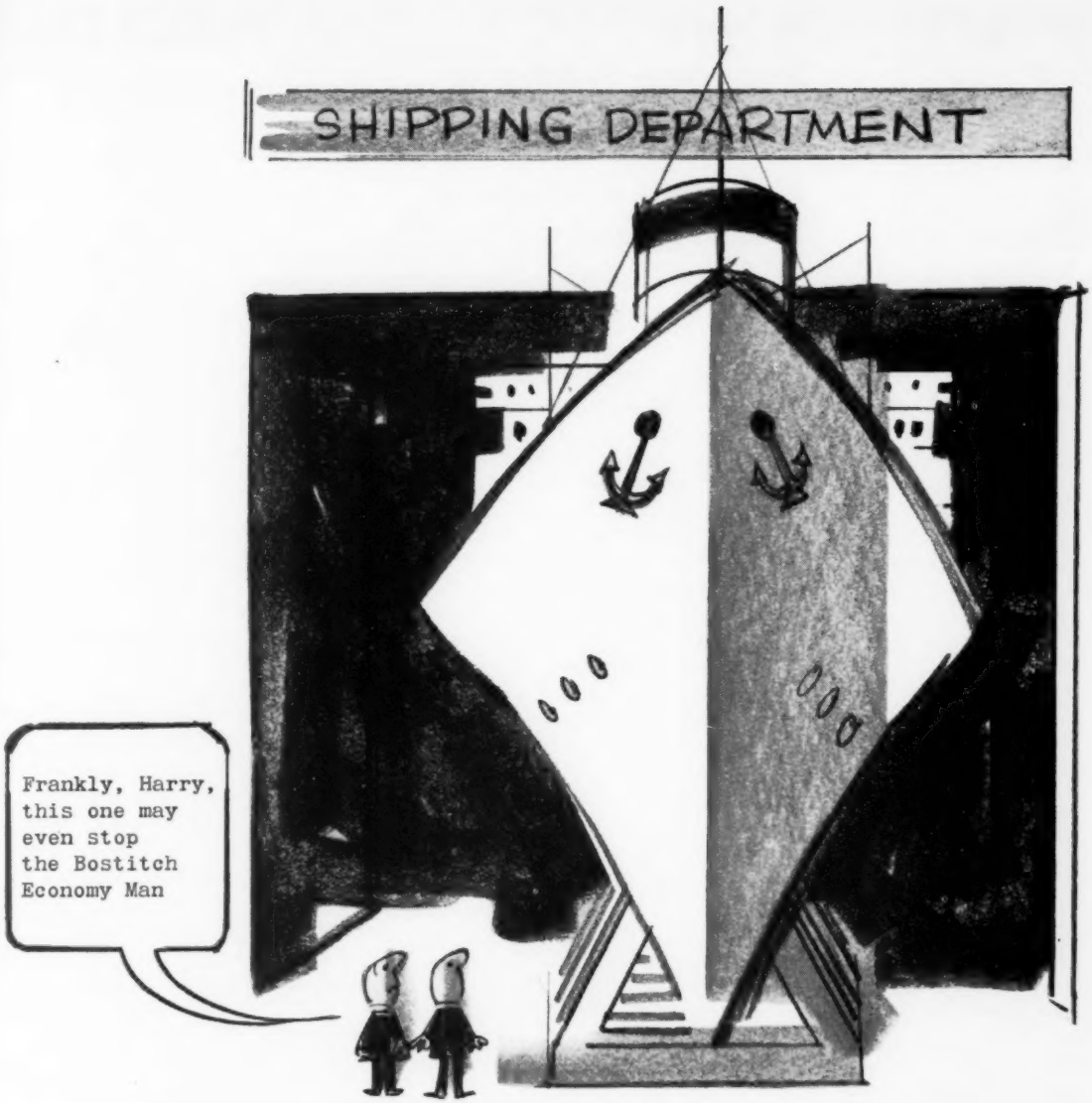
Reader Service Cards inside back cover

Our December, 1960 issue will carry a cumulative editorial index for the year, listing our feature articles by subject, author, and other headings.



Even if the packaging problem seems too big to handle, it's worth your while to check with a Bostitch Economy Man for suggestions.

One did help work out a giant corrugated carton for a line of boats. Packing time was reduced 50%. Out of 3000 shipments, 2998 arrived at their destination completely safe. Two had minor mars. With wooden crates, damage in transit was a common headache for the company and its dealers.

Whatever you pack or ship, the Bostitch Economy Man can probably help you. Working with a wide variety of Bostitch staplers and staples—and with the world's largest fund of stapling experience at his disposal—he'll come up with a time and money saving answer if anyone can.

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A note from the Publisher

Research must be ahead of sales

Is it luck when the package research and development department has the right answer to a problem as soon as the problem comes up? This would certainly be doubtful in an alert, well-organized department.

The well-organized packaging research department is a year or two ahead of the sales department. While it can not foresee exactly what the market demands will be, it prepares for every contingency by continually questioning "today's package"—in the light of what competition might do, how changes in the economy might affect the product demand, and even going so far as to consider what might happen to its product if customers should completely reverse themselves in their choice.

Recently, one of the leading package suppliers in the United States told me how lucky his company was when the sales department demanded a major modification in the product and the research and development team came up with the answer in short order. After some discussion, luck apparently had very little to do with it.

Research, for years, had been working on ways to improve this particular product, even though it was covered by patents, was eminently successful, and overwhelmed competition. The original product enjoyed a virtual monopoly, but as other similar products were brought out, the public began to resist one particular and important aspect of this product. Research, however, had the answer that enabled this company to move on to new highs of acceptance.

Today, for instance, most buyers seem devoted to size—the bigger the package, the better they like it. However, with the increasing sophistication of buyers, isn't it possible that, at some point, they will be less impressed with physical dimensions of a package and more impressed by its quantity?

To illustrate this thought, an interesting package is now being test marketed by Kimberly-Clark for Kleenex. Through a new manufacturing process it is able to pack the same number of tissues in a carton half the size of the carton formerly used. If the package appeals, and thereby sells, it has several quite obvious advantages such as using less paperboard and less shipping and warehouse space.

Retailers might push this brand of tissue because the smaller packages, with the same contents, will bring more dollars in sales out of less shelf space. This is an extremely important factor as rents increase and the number of packaged products increase. If this package is accepted, it certainly will interest other packagers of products for the housewife as well as products for industrial use.

Ultimately, the person who decides what kind of a package will be successful is the buyer, be he an industrial purchasing agent or a housewife in a supermarket, but their choice is not static—it is ever changing. The logical conclusion then could be if your package has a big advantage today, you can not assume that you will automatically retain this advantage.

Angus J. Ray

Publisher

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The PULSE/of packaging

Groups in the news:

PACKAGING INSTITUTE reports that its professional membership now exceeds 500. Its officers and directors report plans to step up its program of professional member meetings and seminars—including a series of regional meetings around the country . . . RESEARCH AND DEVELOPMENT ASSOCIATES of the Quartermaster Food and Container Institute plan to include the discussion of packaging problems of dehydrated products at its forthcoming military-industry conference on freeze drying and other dehydration methods of food preservation. This meeting will be in September in Chicago. (See "For your calendar," Page 2, this issue.)

Trends to watch:

Showing what you can do in applying a new and completely engineered packaging program, ROCKETDYNE, a division of North American Aviation, Inc., reports attaining an 89 per cent reduction in the cost of parts damaged during the first 7 months of this program. At the same time, it brought about a 6 per cent reduction in the cost of packaging materials over a comparable earlier period. We understand key points of the new system include a methods study of the movement of parts between manufacturing departments of plants, selection of standard containers and packing methods for parts classed according to durability.

SUN-LAC, INC., Newark, N.J., aerosol loader, says it has hit on a new process for solubilizing perfume oils in aerosol preparations—thus enabling perfume makers to package perfume, cologne, and toilet water oils as spray products without changing original formulas. We hear the key to this process is the procedure by which ingredients are mixed . . . During 1960, sales of converted flexible packaging products should run at least 11 per cent over those of 1959, thus representing sales of about $560 million according to the U.S. Department of Commerce. Its forecasters also note that the 1960 business both in shipment and dollar volume of the glass container industry should run about 6 per cent above that of 1959. Glass container industry sources think that the upward trend in population and consumer purchasing power, plus the introduction of new lightweight bottles for beverages should hike demand for these products.

The oil industry, now a primary supplier of raw materials for plastics, can hike its own volume and step up the use of plastics by putting its own products into plastic packages. Henry E. Griffith, Thatcher Glass Manufacturing Co.'s plastic container division VP, noting that synthetic resins in plastics are headed downward in cost as production increases, urged his audience to capitalize on convenience packaging for the oil industry—citing use of vinyl plastic tube which fits directly on a grease gun.

Packaging across the seas:

RHEEM AUSTRALIA PTY. LTD., subsidiary of Rheem Manufacturing Co., has acquired STUART BROS., reconditioners of steel shipping containers with plants in Newcastle, Brisbane, Adelaide and Sydney, Australia . . . The Netherlands continues to be a source of packaging machinery development: MACHINEFABRIEK v/h J. W. TERLET of Zutphen has developed a unit that permits simultaneous vacuum packing of multiple food containers for powdered milk, cocoa, or other dry substances, filling packages with inert gas prior to sealing. Another firm, INDUSTRIELE MAATSCHAPPIJ "ARNHEM" N.V., Elst, has come up with a series of horizontal bottle cap punch presses with capacities of up to 12,000 aluminum foil bottle caps/hr., using aluminum strips from 0.002 to 0.004 in. thick.

CLUPAK, INC. has licensed three kraft paper companies in Japan to make its extensible paper. These include CHUETSU PULP INDUSTRY CO., LTD. of Tokyo, DAISHOWA PAPER MANUFACTURING CO., LTD., Tokyo and TOKAI PULP CO., LTD. of Shizuoka Prefacture . . . DOW CHEMICAL INTERNATIONAL LTD. S.A. recently held an international Styron manufacturers symposium, drawing representatives from: ASAHI-DOW LTD., Japan; CSR CHEMICALS, PTY., LTD., Australia; POLYCHEM LTD., India; DOW CHEMICAL CANADA LTD.; PLASTICHEMIE, France; and DISTRENE, LTD., England. Representatives from Dow associated companies in Italy and Greece, where construction of production plants is just getting underway, also participated.

More expansion for packaging:

AMERICAN CAN CO. will extend its operations to the manufacture and sale of glass containers . . . RIEGEL PAPER CORP. and BLOOMER BROS. CO. are planning the merger of Bloomer into Riegel . . . Formation of FIBER STRAP, INC., as a joint corporation to market new developments for strapping and bundling with materials other than steel and wire, was announced by CHICAGO PRINTED STRING CO. and A. J. GERRARD & CO.

THATCHER GLASS MANUFACTURING CO., INC. has acquired all the outstanding stock of the TOLEDO MOULD CO. . . . The new plant of APPLIED RESEARCH AND DEVELOPMENT CORP. for extrusion of polystyrene film is now in commercial production . . . NATIONAL LAMINATINGS SALES CO. has been formed for the sales and distribution of a cold-seal process label for all types of plastic and glass containers.

The purchase of CRAFT CORP., Roseville, Mich., by GENERAL BOX CO. will add corrugated containers to its existing line of heavy-duty wooden containers . . . A. E. STALEY MANUFACTURING CO.'S new pilot plant facility for development of modified starch products for the paper, textile and other industries is now in operation . . . Plans to construct a paper and pulp mill for the manufacture of newsprint and kraft linerboard near Snowflake, Ariz. have been announced by SOUTHWEST FOREST INDUSTRIES, INC.

PAR INDUSTRIES, INC.'S new aerosol filling line will package more than 750,000 units/month . . . A new subsidiary of AMERICAN INSTRUMENT CO., INC.—HYGRODYNAMICS, INC.—has been organized at Silver Spring, Md. . . Its proposed 200,000-sq. ft. plant in Syosset, N.Y. will double COLUMBIA CORRUGATED CONTAINER CORP.'S manufacturing capacity.

In order to expand its contract packaging, vacuum forming and transparent packaging divisions, WILLIAM A. CROOK CO. purchased the Textile Thread Building, Watertown, Mass. . . GLENSHAW GLASS CO. is constructing a 160,000-sq. ft. glass container plant at Orangeburg, N.Y. . . To produce plastic components used in conjunction with metal parts, RISDON MANUFAC-

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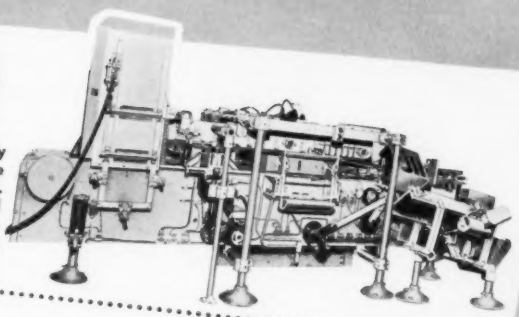

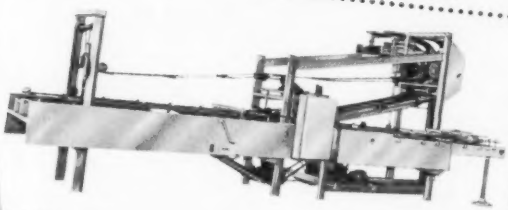

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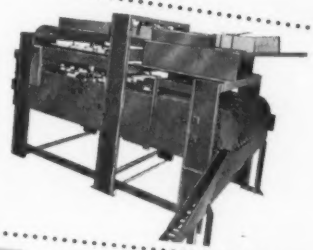

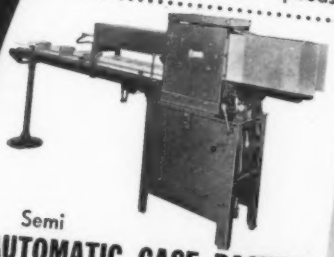

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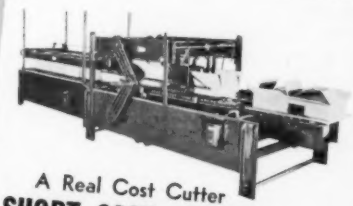

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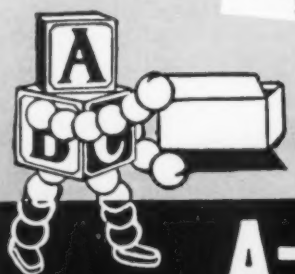

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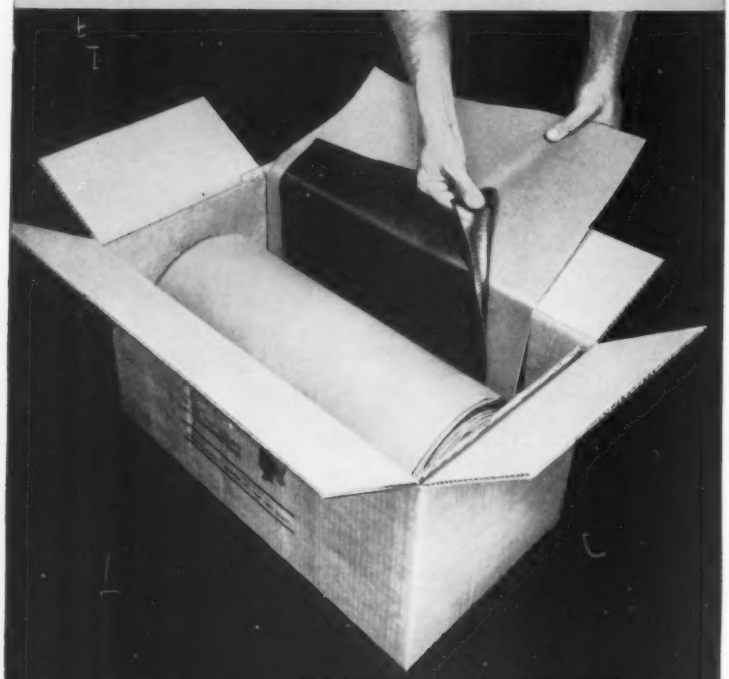

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TURING CO. has created a plastics division.

The modernization and expansion of CHESEBROUGH-POND'S Clinton, Conn. plant is now complete . . . HOERNER BOXES, INC. will build a 180,000-sq. ft. plant for the manufacture of corrugated boxes in Gurnee, Ill. . . U.S. BY-PRODUCTS CORP. has completed a new facility in Kansas City to process laminations of aluminum foil scrap.

A new company to serve the food and packaging field, PACON CORP., has been organized in Rockford, Ill. President is C. J. Smith and vice president, R. M. Peterson . . . Sales and service functions of THE KARTRIDG PAK CO.'S meat packing equipment have moved from Davenport, Ia. to Mount Prospect, Ill. . . Polycarbonate resins are now being produced in commercial quantities by MOBAY PRODUCTS CO.

TUREX PLASTICS, a subsidiary of REXALL DRUG AND CHEMICAL CO., is now producing polyethylene film . . . Production and distribution of chemical specialties products has begun at PENNSALT CHEMICALS CORP.'S new 34,000-sq. ft. plant at Atlanta, Ga. . . PLAX CORP. plans to build a 60,000-sq. ft. plant at Sharonville, Conn.

What people are doing:

H. J. Heinz Co. has appointed E. F. EHRENBERGER as purchasing agent . . . Recent changes at Container Corp. of America—HENRY G. VAN DER EB, vice president, is now in charge of all the company's folding carton operations; ROBERT P. BARSE is now sales manager at Dallas-Fort Worth folding carton plant; JOHN L. PHILLIPS is manager of bakery packaging for the western division . . . HARLEY W. FULMER has been named purchasing agent by Koh-I-Noor Pencil Co., Inc.

At Campbell Soup Co., GEORGE W. CRABTREE, former vice president—containers, has been elected vice president—operations . . . At the industrial division of The Kordite Co., CHARLES V. TRAWICK is district sales manager and JOHN W. BUNKER, field sales representative. Also at Kordite, WILLIAM S. SCHRECK is product manager of the Flexcord division and MELVIN S. CAGEN is plant technical superintendent of manufacturing facilities in Macedon, N.Y.

Executive realignment at The Lord Baltimore Press resulted in these changes —ALLEN STALEY, vice president—sales, FRANK J. BAGAMERY, vice president —industrial relations and personnel, ROLAND F. BOEHM, administrative assistant to the executive vice president . . . Celanese Corp. of America has appointed ROBERT L. MITCHELL to the newly established position of vice president—planning . . . Management changes at

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Raking in the pot when we're "called" to bet our labeling machine against all comers is real *straight poker*. Only the facts count . . . a machine cannot bluff its competitor.

In several instances we have been in that kind of game . . . our machine *in* the plant . . . competition offering to put theirs in on a trial "winner-take-all" basis. We've yet to lose and we're confident that no other labeling machine, anywhere, will match the all-round production and versatility of the Super C.M. in the foreseeable future.

There are some mighty good reasons for this advantage. Reasons that were designed into the machine before it left the drawing boards. *Over 150 Super C.M.s are now in field operation.*

Your WORLD Sales Engineer will be happy to show you 18 reasons why you should bet on the Super C.M., too! May we arrange a meeting?

WORLD LABELERS

ECONOMIC MACHINERY COMPANY • WORCESTER 3, MASS. / Division of Geo. J. Meyer Manufacturing Company

Specify the single polyethy

crystal-

and

It's Du Pont's exclusive 2-IN-1 polyethylene

Here's a major step forward in polyethylene film for bag packaging . . . Du Pont's exclusive new 2-in-1 polyethylene film. It's the only polyethylene film that combines *both* crystal clarity *and* toughness.

- How clear is it? Du Pont's new 2-in-1 polyethylene film is as clear as the clearest polyethylene film you can buy.
- How tough is it? Du Pont's new 2-in-1 polyethylene film offers a toughness matched only by hazy, high-impact polyethylene.

lene film that's both

l-clear

dtough!

film designed specifically for bag packaging

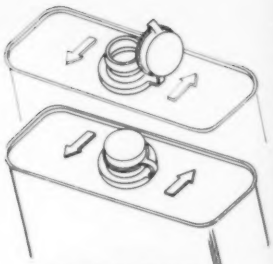
This means you no longer have to sacrifice clarity for durability when specifying a polyethylene bag film!

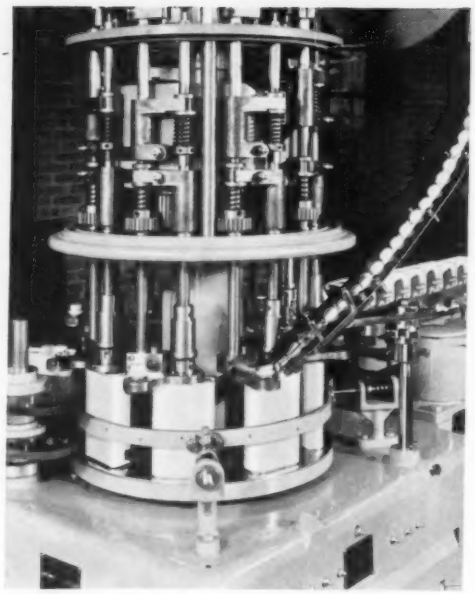
Du Pont 2-in-1 polyethylene film is now available in printed roll stock and bags through Du Pont Authorized Converters . . . or plain roll stock from your Du Pont Representative. Call an Authorized Converter or Du Pont Representative for all the facts on this latest advance from Du Pont . . . leader in packaging film for 35 years. Du Pont Company, Film Dept., Wilmington 98, Del.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DU PONT polyethylene film

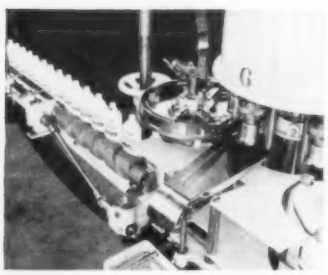




HERE'S BEST WAY TO APPLY THE NEW PLASTIC "FLIP CAPS"

Plastic "Flip Caps" give the new 1960 look to both "F" and "I" type cans. Consolidated has perfected the dependable, fully automatic method for applying these new plastic closures which replace the soldered screw-neck nozzles which have been in use for over 25 years.

The new D8-FS Consolidated Capper is available in models with 2 to 8 spindles and with capacities from 40 to 250 containers per minute. The plastic fitments with *captive plastic caps* are fed from a hopper and inserted by straight down pressure rather than rotary screw motion previously used on metal screw caps. Caps are oriented with hinge strap parallel to length of can. Cost-consuming soldering is eliminated by the neckless can — your packages are up-dated for increased consumer appeal. Consumers prefer this type cap because of convenience of handling. Both quart and pint sizes can be handled with equal ease.



Consolidated D6-F Capper in use at S. C. Johnson & Co. applying plastic screw-type closures with captive caps to plastic containers. The new design, adjustable tension grips hold plastic containers firmly without collapsing them. Capacity 120 containers per minute.

For complete information about this most modern equipment for applying these most modern caps, write today.

CONSOLIDATED PACKAGING MACHINERY CORP.

A Subsidiary of International Paper Company

1400 West Avenue, Buffalo 13, N. Y.

Bemis Bro. Bag Co.'s western operations are: J. D. RICHARDS, manager of the Seattle plant and Pacific Northwest sales division; E. G. MUIR, assistant manager at Seattle; J. M. PRUDHOMME, manager of the Vancouver multiwall plant; F. W. AYERS, manager of the Wilmington, Calif. plant and the Los Angeles sales division; L. L. CONRAD, JR., manager of the San Francisco plant and sales division.

GEORGE J. LAWRENCE has been named purchasing agent of Crompton & Knowles Packaging Corp.'s newly-created purchasing department. . . . Also at C & K, HARLAND S. FISHER has been named vice president, engineering . . . International Paper Co.'s container division has named new sales managers for three plants—WILLIAM J. HINDLE and GILBERT G. FRYER, Whippany, N.J. plant; RICHARDSON W. KNOWLAND, Manchester, N.H.; CLIFFORD E. PACE, Geneva, N.Y. . . JOHN N. GRUNDY has joined Chicago Molded Products Corp. as a sales representative for the Campco division.

Three new regional managers at Sprayon Products, Inc. are EDWIN O. BERGDAHL, West; WILLIAM C. MURPHY, Midwest; JOHN R. SINDING, East . . . New technical director at Gene Rose Co., Inc. is EUGENE L. BARNETT . . . The Western Waxide division of Crown Zellerbach Corp. has named three new assistant sales managers—ROBERT J. SCHOKNECHT, industrial dairy packaging; GORDON M. BRUCE, frozen food and meat packaging; Z. WILLIAM (BUD) FISHER, bakery packaging.

At the Hinde & Dauch Div. of West Virginia Pulp and Paper, GENE BEEKEN, former sales manager of the Eaton, O. box plant, moves to Detroit, and F. PAUL ANDRES replaces him at Eaton . . . HARVEY H. GERVAIS has been named treasurer of Bostitch, Inc. . . . West Coast sales manager for U.S. Printing & Lithograph Div., Diamond National Corp., is JAMES A. GAGE.

IMCO Container Corp. has appointed two vice presidents—LAWRENCE V. RHEA, sales and FREDERICK L. KOCHER, marketing. . . . In the research and development division of American Viscose Corp., DR. FRANK H. REICHEL, JR. is director of corporate research responsible for development of new products. He will be assisted by DR. WAYNE A. SISSON. JOSEPH E. ROSS is manager of research and development services. Also at Avisco, ROBERT O. BARFOOT is head of the packaging development laboratory. . . . Chase Bag Co. has named RICHARD J. PRICE chief industrial engineer.

LEWIS E. ALEXANDER has been named salesman in the South for Olin Mathieson Chemical Corp.'s packaging division. Also at Olin, MILTON O.

DOW Plastiatrics

DOW'S CLINICAL APPROACH TO HEALTHY PLASTICS APPLICATION

in packaging

STUDIES OF GAS PERMEABILITY GIVE VALUABLE DATA ON MOLDING MATERIALS FOR PACKAGING

Plastic packages often must have a specific resistance, or lack thereof, to gas and vapor passage, such as in the packaging of aerosols, carbonated beverages, and foods. Data on gas permeability, provided by Dow Plastiatrics studies, will be of value to packaging engineers and designers in the selection of proper barrier materials for use under known environmental conditions.

In the process of permeation—involving solution of the gas in the barrier material, diffusion through the barrier, and escape as a gas from the opposite side—permeability (rate of gas passage through a barrier of unit thickness) is a function of the diffusion rate and solubility of the gas in the barrier. Variables which affect permeability include temperature of the system, composition of the barrier, and size, shape and configuration of both the barrier molecules and gas molecules.

The general equation for evaluating degree of resistance to gas transmission through a barrier is:

$$R = \frac{\overline{P}\, A\, \Delta p}{d}$$

where:

R = Gas transmission

$\overline{P}$ = Coefficient of gas transmission

A = Transmission area

Δp = Pressure differential across barrier

d = Thickness of barrier

$\overline{P}$ of the material must be measured experimentally, and accurate data can readily be obtained from film samples. For example, $\overline{P}$ data for Styron 666 is plotted on the basis of

$$\frac{\text{cc - mil}}{\text{100 in.}^2\text{ - 24 hrs. - atm.}}$$

in Figure 2.

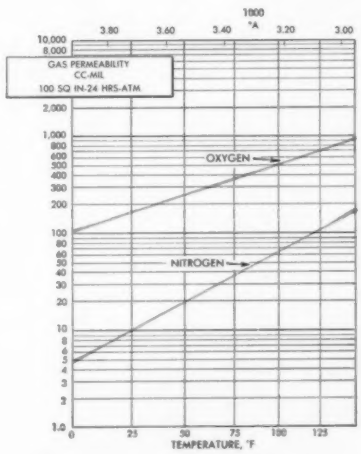


Fig. 2—Coefficients of Gas Transmission of Styron 666 for various gases and temperatures.

Thus, R values for containers can be obtained by substituting wall area and thickness along with known transmission coefficients in the formula.

Different sets of units are found in existing literature on permeability, and Figure 1 provides conversion factors for reducing the various units to common values.

Manufacturers and end users of containers are invited to consult with Dow on container problems. Contact your nearest Dow sales office or THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Dept. 1872DH8.

AMERICA'S FIRST FAMILY OF THERMOPLASTICS

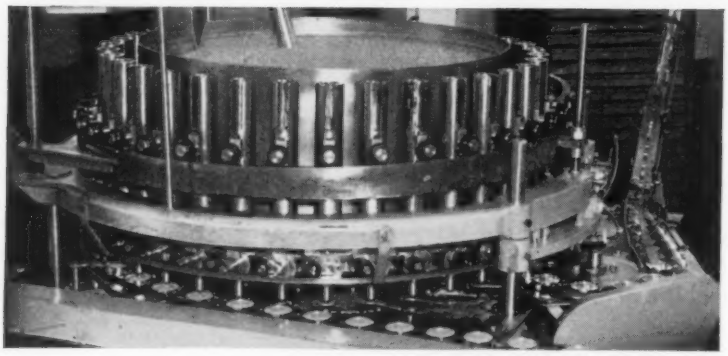
Styron® • Zerlon®
Ethocel®
Tyril® • Polyethylene
PVC Resins
Pelaspan® • Saran

Fig. 1—Conversion factors for reducing permeability units to common values.

	MULTIPLY					
TO OBTAIN	$\frac{\text{cc-mm}}{\text{m}^2\text{-sec-cm Hg}}$	$\frac{\text{cc-mm}}{\text{m}^2\text{-sec-atm}}$	$\frac{\text{cc-mm}}{\text{m}^2\text{-24 hr-atm}}$	$\frac{\text{cc-mil}}{\text{100 in}^2\text{-24 hr-atm}}$	$\frac{\text{cc-mil}}{\text{m}^2\text{-24 hr-atm}}$	$\frac{\text{cu in-mil}}{\text{100 in}^2\text{-24 hr-atm}}$
$\frac{\text{cc-mm}}{\text{m}^2\text{-sec-cm Hg}}$	1.0	1.32×10^{-2}	1.52×10^{-7}	6.00×10^{-8}	3.87×10^{-9}	0.98×10^{-6}
$\frac{\text{cc-mm}}{\text{m}^2\text{-sec-atm}}$	76.0	1.0	1.16×10^{-5}	4.56×10^{-6}	2.94×10^{-7}	7.47×10^{-5}
$\frac{\text{cc-mm}}{\text{m}^2\text{-24 hr-atm}}$	6.57×10^{6}	8.64×10^{4}	1.0	0.39	2.54×10^{-2}	6.45
$\frac{\text{cc-mil}}{\text{100 in}^2\text{-24 hr-atm}}$	1.67×10^{7}	2.19×10^{5}	2.54	1.0	6.45×10^{-2}	16.4
$\frac{\text{cc-mil}}{\text{m}^2\text{-24 hr-atm}}$	2.58×10^{8}	3.40×10^{6}	39.4	15.5	1.0	2.54×10^{2}
$\frac{\text{cu in-mil}}{\text{100 in}^2\text{-24 hr-atm}}$	1.02×10^{6}	1.34×10^{4}	0.16	6.10×10^{-2}	3.94×10^{-3}	1.0

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

FLUIDICS* AT WORK

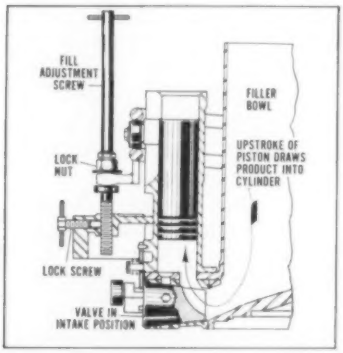


How to evaluate piston filler design in terms of profits

Take a look at the *total* design approach in a Pfaudler® rotary piston filler and you'll see how *every* factor can contribute to profits.

Start with the piston. Here you have the proper combination of smooth fit and small "cushion" so you can handle

the piston and valve. There are no gaskets to clean and refit, no adjustments to make after cleaning.



products ranging from light, to heavy viscous fluids.

Accuracy is ±1/10 fluid ounce for most products. There's no surging, no splashing, no piston leakage.

Next check the *fill adjustment mechanism*. With a Pfaudler filler you can adjust fill accuracy from a single control point without dismantling or even stopping the filler.

Cleaning is simple and rapid. One man can do it thoroughly in one-half hour. He can do it without tools or hoists by removing only two parts per station,

Lubrication is well provided for, since all grease fittings are tied in to very accessible headers. And all gears are submerged in oil.

Repairs are kept to a minimum, since there are only four primary wearing parts—piston and valve rollers, valve trip cam, and valve-lock wear pad. You will find that all are modestly priced, easy to stock and replace.

Over-all weight, and how it is supported, also should be considered. The sturdy base and over-all ruggedness are a hallmark of every Pfaudler filler.

Name the product, rate and container and you'll find a Pfaudler filler to handle it profitably. Choose from machines with 6 to 36 stations, to handle glass, paper, prepack or tin.

Get detailed specs by writing to our Pfaudler Division, Dept. PE-80 Rochester 3, New York.

*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.

PFAUDLER PERMUTIT INC.

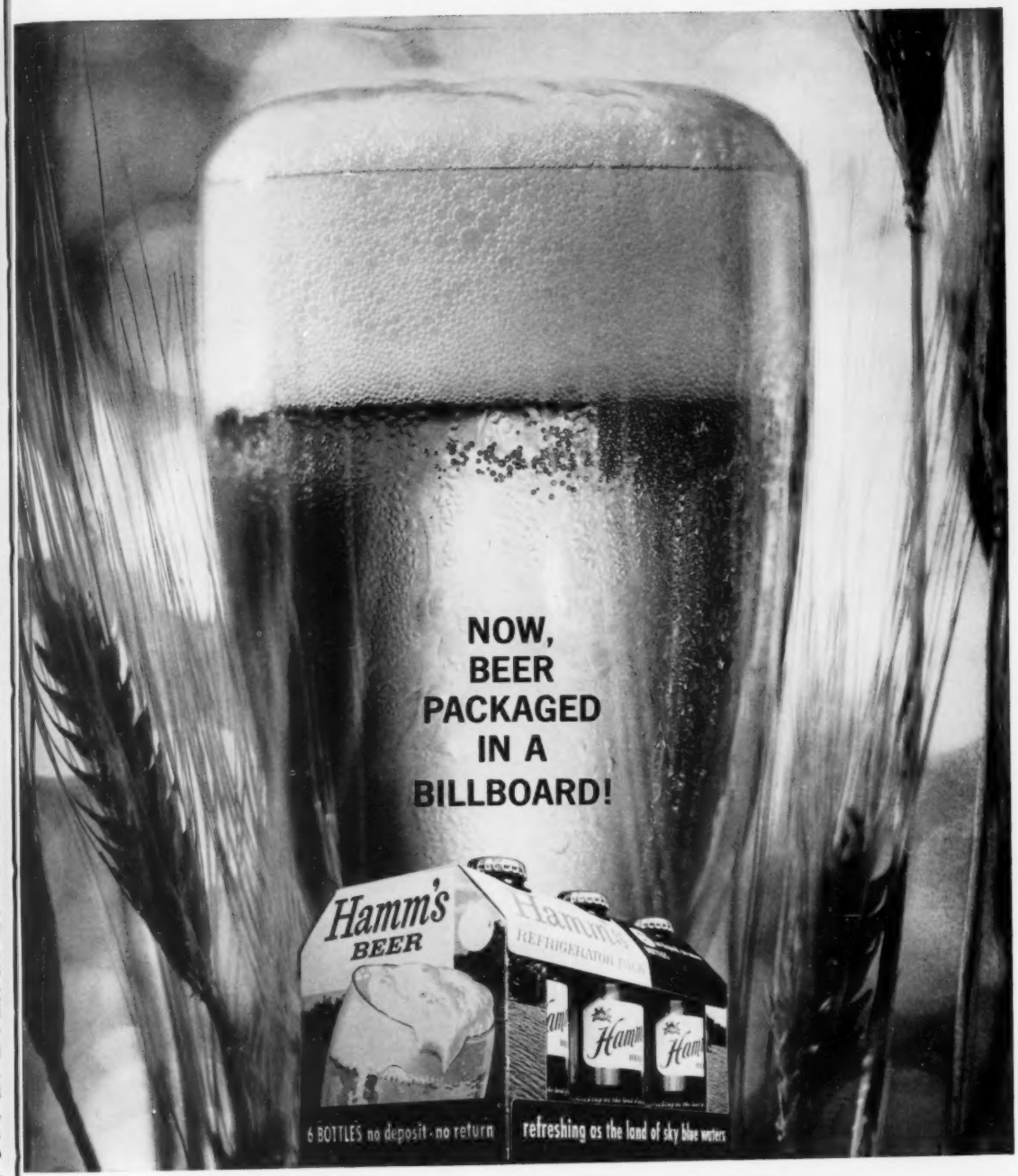
Specialists in FLUIDICS...the science of fluid processes

SCHUR, former director of research and development for Ecusta Paper operations, is now vice president for research of the packaging division. DR. DAVID C. LEA replaces Mr. Schur at Ecusta, and DR. THOMAS ZENTNER replaces Dr. Lea as director of research and development for forest product operations . . . Kaiser Aluminum & Chemical Corp. has named ROBERT P. JENSEN as manager of industrial foil, laminations and containers. ROBERT H. LUCAS was named to succeed Mr. Jensen as industrial foil and container sales manager. Also at Kaiser, JOHN F. DELANY is now manager of can sales. . . Dodge Fibers Corp. has two new sales managers—S. WHITNEY DICKEY, distributor sales and WILLIAM PETITT, technical sales.

WILLIAM C. STOLK was elected chairman and chief executive officer of the American Can Co. and ROY J. SUND, president of the company. At American's Marathon Div., RICHARD J. ROHLOFF has been appointed to a sales position headquartering in New York City. . . Union Bag-Camp Paper Corp. has elected ARTHUR J. GOETZ director and vice president . . . At the container division of Rheem Manufacturing Co., G. GWYN TUCKER is the new national accounts sales manager and BEN F. CAKE is manager of operations. WILBUR G. KELSCH is the new plant manager of Rheem's Richmond, Calif. plant.

LAW G. WEINER will supervise customer service in National Can Corp.'s central division research department. Two new plant managers at National are H. DALE JORDAN, Los Angeles and ROBERT P. PALM, Vancouver. . . EDWARD F. BURKE has been promoted to assistant vice president of marketing of Standard Packaging Corp. . . . At Reynolds Metals Co., CLEMONS H. DAVIS has been named packaging sales manager for the Pacific region and HAYDEN C. CLEMENT, who formerly held the position, has been appointed sales promotion manager for the region. Promotions in Reynolds' printing and foil divisions are: J. E. ROBERSON, manager of the St. Louis printing plant; DALE WILEY, manager of the North plant, Richmond; FRANK J. SCHAY, superintendent of the St. Louis facility.

Two appointments in the market development division of A. E. Staley Manufacturing Co. are—ELLSWORTH E. KIMMEL, director of the industrial market development department, and CONSTANTINE J. BALLOS, head of paper industry section. . . St. Regis Paper Co. has appointed THOMAS GERACE resident manager of the printing paper mill at Bucksport, Me. J. P. CORBIN replaces Mr. Gerace as resident manager at the Sartell, Minn., mill. (*End*)



Fibreboard Solves Industry Need with New Fibresix Carton. Hamm's Western Division is sending its glass cans to market in the new Fibresix Display Carton. Precisely engineered and unique in construction, Fibresix separates bottles at top and bottom to prevent breakage and projects a larger, more sales-effective billboard display area at both ends of the carton. In addition, Fibresix provides up to 50% savings on packaging costs!

Fibresix exemplifies Fibreboard's ability to serve you. Fibreboard is the only major carton and container manufacturer in the United States whose entire marketing effort . . . scientist to salesman . . . is organized to meet the marketing problems in your specific industry. And for actual package production, Fibreboard's facilities are the largest, most modern in the whole wide West!

For any possible packaging assistance, phone or write: Fibreboard Paper Products Corporation, 475 Brannan Street, San Francisco, California. **Where Specialists in YOUR Market Work on YOUR Packaging Needs . . .**

FIBREBOARD

Chicago, Denver, Los Angeles, New York, Omaha, Seattle and other major cities.

Fibreboard also serves the West with its complete line of building and decorating materials . . . marketed under the PABCO banner since 1884.

FOIL BONDING . . . ANOTHER WAY THERMOGRIP ADHESIVES HELP SOLVE PACKAGING PROBLEMS.

The long seam of this foil plant bag is sealed by THERMOGRIP to provide a flexible, waterproof joint.

THERMOGRIP applicators mounted on standard cartoning equipment made it possible to replace hand closing of this foil package with automatic carton sealing.

THERMOGRIP adhesive made possible faster production, surer bonds and better performance of this new tear strip Kaiser Foil package.

THERMOGRIP® ADHESIVES
Bond Foil at Higher Speeds

THERMOGRIP adhesives provide instant bonds on foil. There is no waiting for drying of the adhesive; pressure stations are eliminated, and machines can be operated at higher speeds. The simple design of the applicator and adhesive system makes installation easy on many types of packaging and converting machines. Glue pot cleaning is eliminated.

THERMOGRIP adhesives can be applied at top machine speeds in dots, dashes or continuous bands in a variety of widths. In addition to foil, plain boards, waxed boards, porous paper, polyethylene and many other materials are readily bonded.

If you are interested in clean, dry, high-speed sealing send us samples of your packages or product. Write us explaining your sealing objectives.

United

UNITED SHOE MACHINERY CORP.
140 Federal Street, Boston, Mass.
Liberty 2-9100

For more information circle No. 212 on Reader Service Card

INTERNATIONAL PAPER—The Ultimate Source

This box tells an amazing story—inside and out

(More packaging news from International Paper)

Read how a bright printing surface and light-colored interior are combined in IPX* Board.

Now, International Paper has developed an economical packaging board to meet the challenge of today's mass marketing.

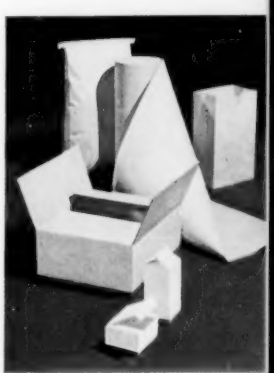
Over 2½ years ago, our skilled craftsmen went to work. First, they developed a new papermaking technique to blend two different pulps into one. Fine bleached sulphate pulps and inexpensive groundwood pulps. The result—IPX. A machine clay-coated board with a bright surface and light-colored interior.

Next, they subjected IPX Board's smooth, bright surface to printing, varnishing and lacquering tests. It printed beautifully. Varnish and lacquer coatings retained lasting color brilliance and uniformity.

Today, quality printing (up to 175-line screens) on IPX results in packages that practically *sell on sight*.

At International Paper's research centers and 16 mills, experimental papermaking processes and packaging innovations, such as IPX Board, are in continual development.

That is why International Paper can provide you with the widest range of papers, boards and packaging assistance in the industry. Call us or contact your converter—he's probably been doing business with us for years. *T.M.

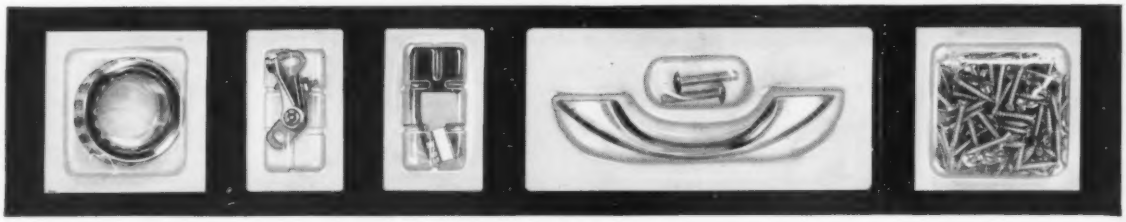


INTERNATIONAL PAPER New York 17, N. Y.

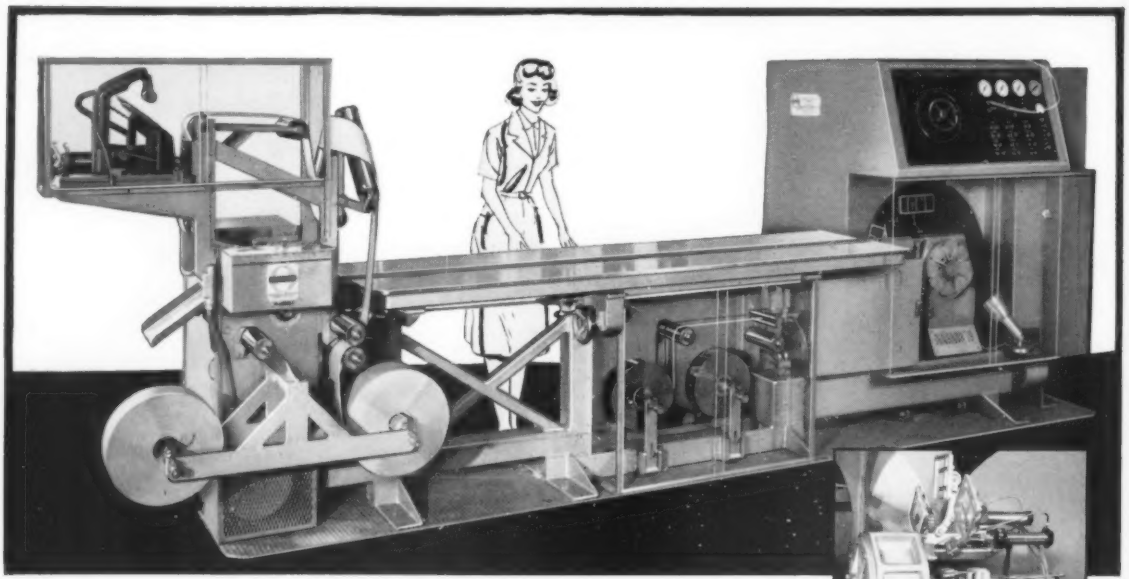
Manufacturers of papers for magazines; books and newspapers • papers for home and office use • converting papers • papers and paperboards for packaging • shipping containers • folding cartons • milk containers • multiwall bags • grocery and specialty bags and sacks • pulps for industry • lumber, plywood and other building materials

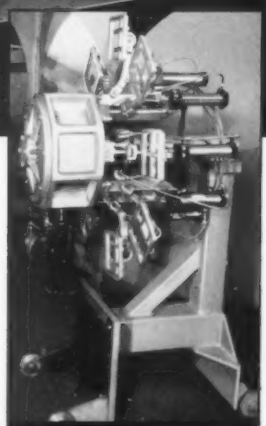
"BLISTER PACKS"

Protect and Promote Products



Sundstrand Packmaster Model 58 Features Fast Change-Over of Crystal-Clear Blisters for Various Product Shapes and Sizes





Wheel-mounted drum assembly is rolled to Packmaster, locates on two dowels, and is held in place by two studs fitted with hand knobs. Two hose connections, for air and vacuum, are provided with quick disconnect fittings.

Perfectly clear vacuum-formed blister packages up to a rate of 125 per minute flow (3″ x 3″ package) from the Packmaster 58 in single or multiple units, or in a continuous ribbon. Interchangeable, wheel-mounted complete drum assemblies permit product changes in five minutes or less. Vacuum-draw is engineered for each drum as integral design factor — assures blisters of perfect transparency for full, clear product exposure.

Stand-by rolls of film and cover paper permit splicing without machine shutdown for high production rates. Automatic printing of trade-marks, parts numbers, or codes can be set for a wide range of cycles. Enclosed film, oven and sealing assemblies exclude dirt and dust, assure perfect protective sealing. Simplicity of operation insures skilled results with inexperienced operators. Automatic feed or hopper loading is available for special production demands.

Write for Model 58 Packmaster brochure.

SUNDSTRAND

SUNDSTRAND-AMERICAN BROACH

ANN ARBOR, MICHIGAN • DIVISION OF SUNDSTRAND CORPORATION

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Circle No. 215 on Card

Zip-Tape

Zip-String

Zip-Strip

unpackaging is important too!

DOBECKMUN

Nothing so antagonizes a customer as a hard-to-open package. Modern films, with their high abrasion resistance and tensile strength, can be brutes. Dobeckmun Zip-Tape®, Zip-String and Zip-Strip can make any kind of a package a cinch to open, while not yielding one inch in either appearance or shelf life. Dobeckmun has a quick opening device for nearly everything that comes in a flexible package—ZIP-TAPE for cellophane and foil—ZIP-STRING recommended for the toughest laminations—ZIP-STRIP for products not affected by moisture loss or gain...a serrated edge to polyethylene bags and overwraps. For full information about this and other aspects of Packages for Performance, write THE DOBECKMUN COMPANY, A Division of the Dow Chemical Company, Cleveland 1, Ohio • Berkeley 10, California • Offices in most principal cities.

The YEAR before Christmas

Wrapped, ready and securely protected in VITAFILM

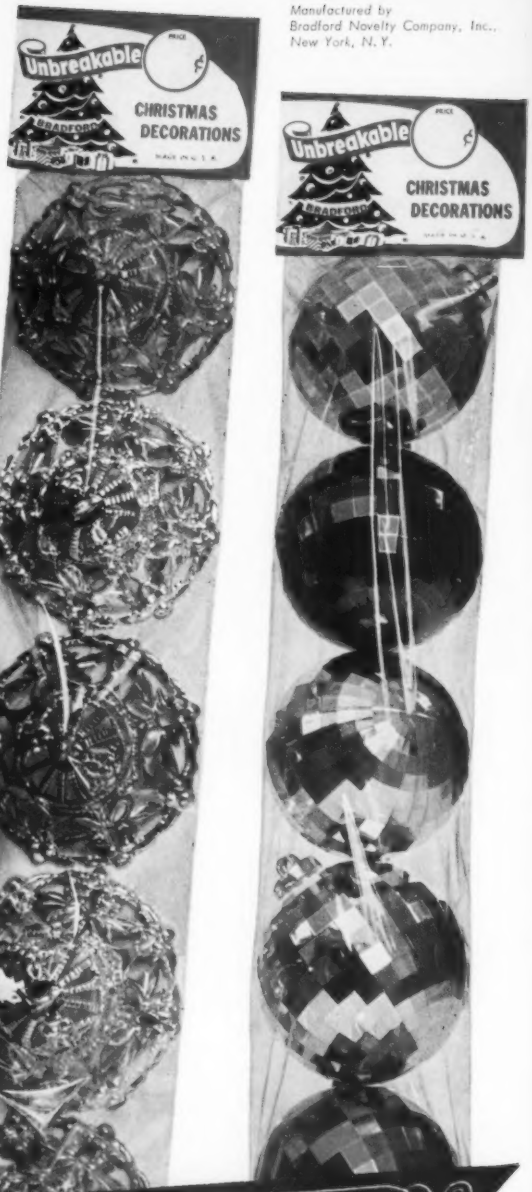
It's safe to do your holiday wrapping early—a *year* early, when the wrapping material is VITAFILM.

In the case of the unbreakable Christmas tree ornaments shown here, the packaging is done as many as 14 months before the contents go on sale. The reason: VITAFILM provides all the protection needed to see the goods through to the ultimate consumer.

This tough, clear Goodyear film seals to a positive welded seam. In addition to long shelf life, it withstands temperature changes, rough handling, doesn't split or run, doesn't attract dust, prints beautifully.

And it adapts readily to all types of automatic packaging machinery. Whatever your product or problem, it'll pay you to investigate VITAFILM. Superior in many ways, unique in some, it's near perfection in low-cost packaging protection. Your Goodyear Packaging Representative can give you further details, or write: Goodyear, Packaging Films Dept. T-6432, Akron 16, Ohio.

Manufactured by
Bradford Novelty Company, Inc.,
New York, N.Y.



by **GOODYEAR**

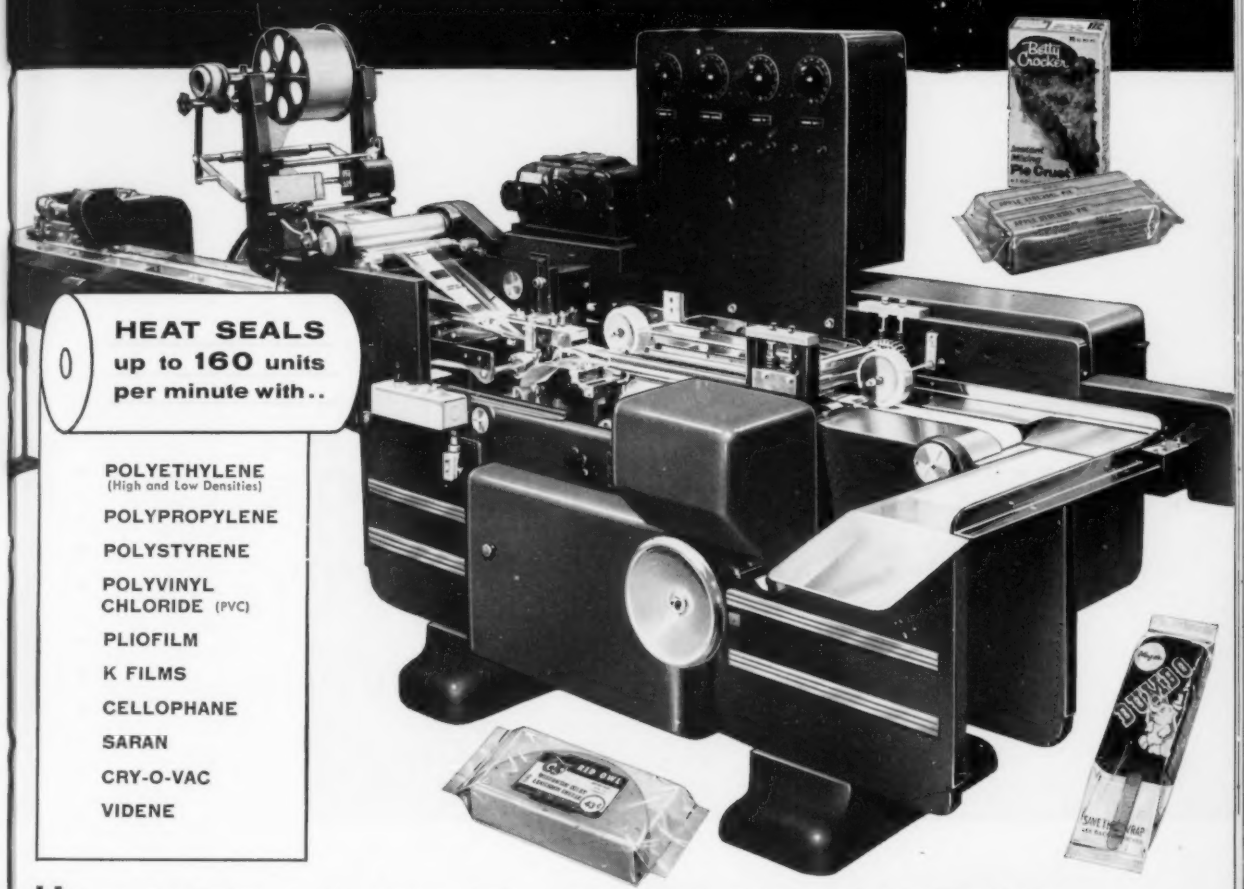
Vitafilm, a Polyvinyl chloride—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

The best thing between you and your customer

For more information circle No. 218 on Reader Service Card

NOW- there's practically NO LIMIT to the types of flexible films you can Speed-Wrap and Heat-Seal on the FMC Campbell® WRAPPER

...INCLUDING SHRINK FILMS!



HEAT SEALS up to 160 units per minute with..

- POLYETHYLENE (High and Low Densities)
- POLYPROPYLENE
- POLYSTYRENE
- POLYVINYL CHLORIDE (PVC)
- PLIOFILM
- K FILMS
- CELLOPHANE
- SARAN
- CRY-O-VAC
- VIDENE

High speed packaging up to *160 units per minute* with almost every type of heat-sealable flexible material—*including shrink films*—is now possible on the CAMPBELL Wrapper. Exclusive method of "float" wrapping from continuously fed roll stock permits trouble-free packaging production without static interference slow down or stoppage as in many reciprocating or sheet fed processes. It also minimizes product damage and waste. Constant automatically regulated heaters and controlled dwell-time insure positive longitudinal and cross-sealing of all materials. Special tunnel attachment provides for shrink films. Let us show you how the CAMPBELL Wrapper can wrap and seal an amazing range of product shapes in neat, close-fitting attractive wraps in less time, with less labor and with less material.

Quick Conversion from Poly to Cello

A capable machine operator can convert from Poly to Cellophane by simply installing a set of crimpers with heaters and a stationary tube sealing unit — *all in less than 30 minutes!*

FMC Campbell® WRAPPER

Putting Ideas to Work

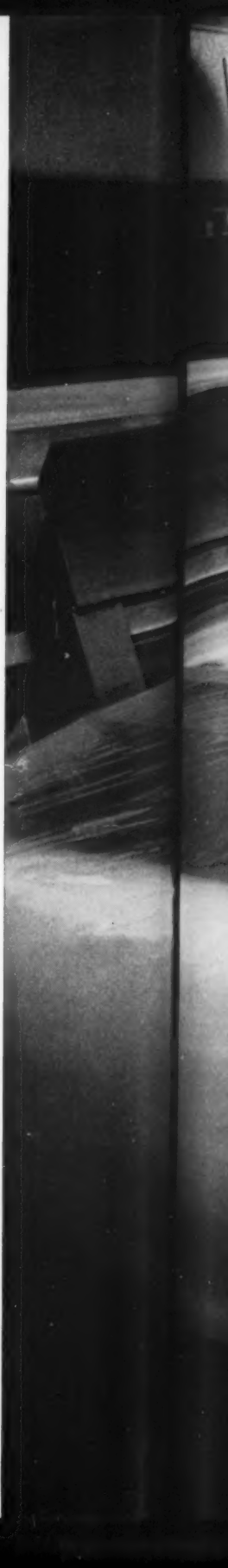
fmc FOOD MACHINERY AND CHEMICAL CORPORATION ®

FOOD MACHINERY AND CHEMICAL CORPORATION

FMC Packaging Machinery Division

Hudson-Sharp Machine Company

1201 MAIN STREET, GREEN BAY, WISCONSIN



This new method of skin packaging, utilizing Monsanto Polyethylene as a coating permits the film to be sealed to an uncoated-unperforated paperboard base. It allows full visibility of product and printed message on the base, protects against pilferage, keeps out dust, dirt, and moisture. Skin packaging method (both film and machinery) used to package Atlas Precision Products Co. gears, developed by Print-A-Tube Co., Paterson, N. J.

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Monsanto Polyethylene resins were specifically developed for industrial packaging applications. Monsanto "Big Batch Uniformity" in production assures dependable packaging service—in skin packaging, and in bags and liners.

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if you can hold it in your hand (and it is reasonably rectangular) • • •

Battle Creek Machines can probably wrap it better,

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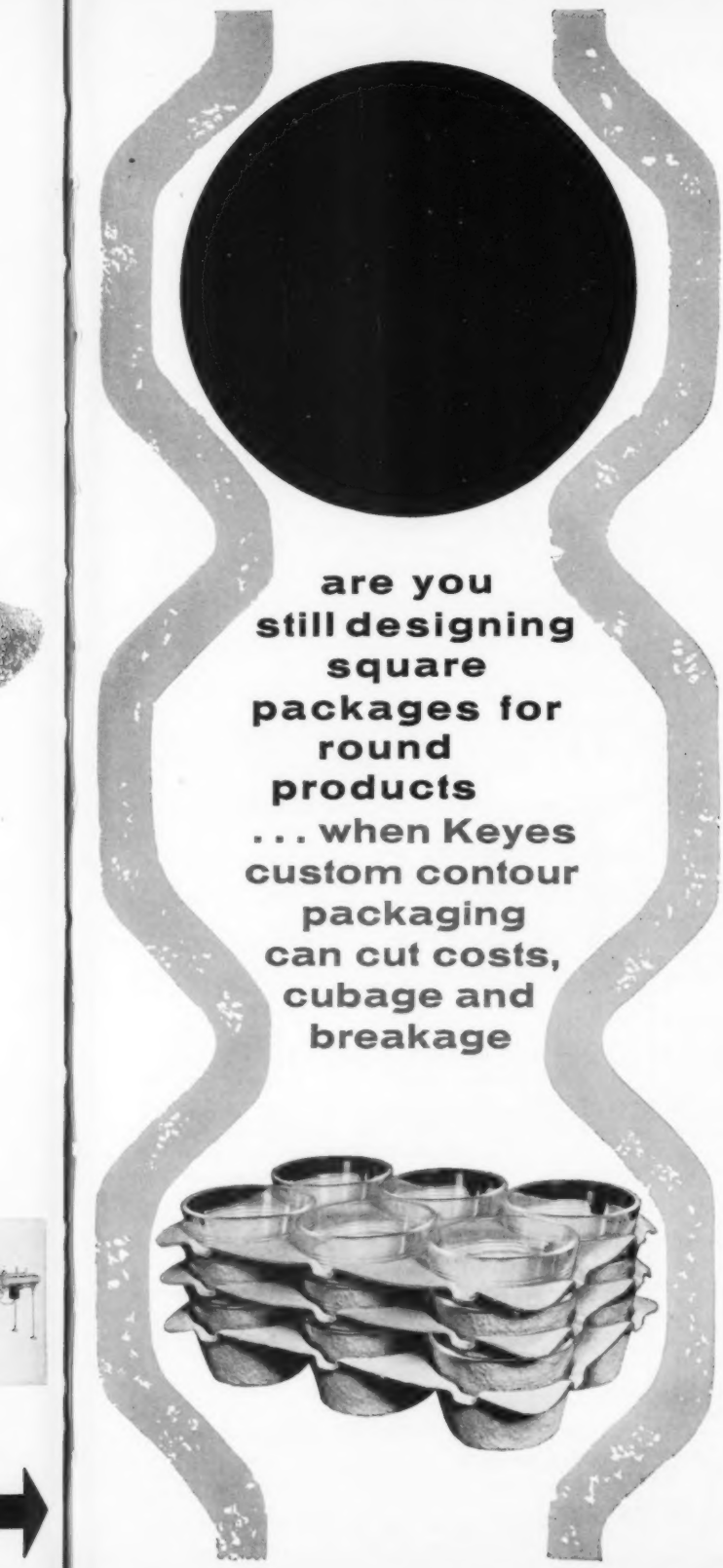
Proper packaging methods are related not only to product protection but also to costs, shipping, merchandising and production. A machine which has satisfied management demands for efficient performance in these areas is the Model 47 Variety Packager. Bakery, textile, paper and food products are tightly, firmly wrapped in heat sealing cellophane, wax coated paper or laminated foil at speeds up to 80 per minute. The Model 47 economically creates striking wraps within a size range of 5½" to 12½" long, 2" to 7⅛" wide and 1" to 4½" high. Changeovers take only 10 to 15 minutes. Ask for details today.

Continuous Flow® PACKAGING

BATTLE CREEK *packaging machines, inc.*, BATTLE CREEK, MICH.



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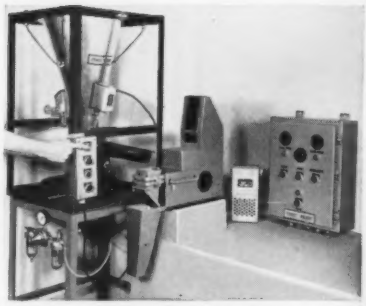
weigh and feed any dry, free-flowing materials



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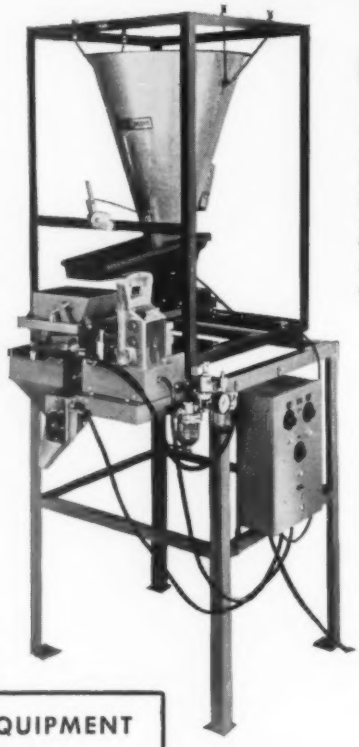
Model 4601NW, above, is designed for weighing dry products with accuracies of 1/10 gram on quantities below 10 grams and one percent accuracy on quantities of 10 grams and above. Combines a high-accuracy Shadograph Scale, air-operated dump mechanism, hoppers, vibratory feeders and photoelectric controls. Precision models with capacities from 50 grams to 500 grams. Write for Bulletin 3363.

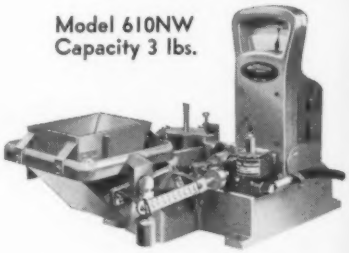
FOR PACKAGING, BAGGING, BATCHING, COMPOUNDING

Over-under indicator provides constant visual check on weighments



Model 620NW
Capacity 10 lbs.

Model 610NW
Capacity 3 lbs.



Net Weigher can be supplied without the feeder machine, support frame and discharge chute. The unit may be adaptable to your specific operation. Write for Bulletin 3318.

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TYPE 1250
Case and Bag
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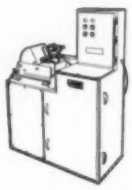
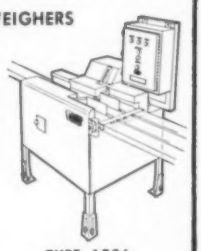


TYPE 145



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END TOWER SCALES

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CENTER TOWER SCALES

High speed, smooth operation and accurate control are among the many advantages of Exact Weight Automatic Net Weighing Machines.

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Exact Weight offers counsel for weighing problems based on 45 years of experience in industrial scales for all types of applications. Our recommendations will be tailored to your specific needs . . . and at no obligation. Write for Form 3311.

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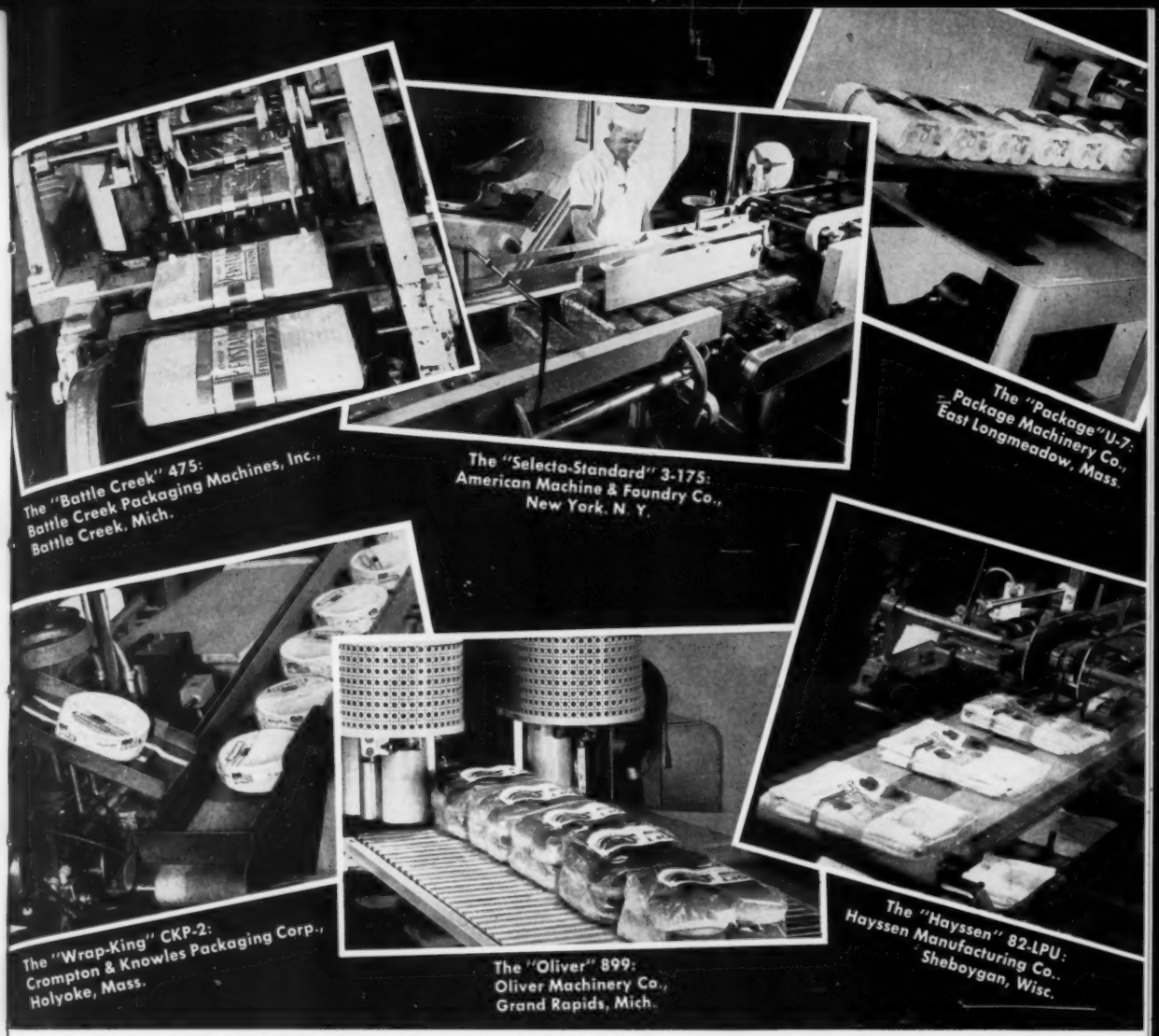

Proved automatic overwrap machines like these can put polyethylene's savings in your product

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Why? Because the per pound cost of polyethylene film is lower than conventional film. And, you get *more* film per pound.

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Ask any leading maker of high-speed, automatic polyethylene machines how much his machine can return on an investment geared to your needs. And get our two booklets about automatic polyethylene overwrapping. Write Dept. **CJ-101**, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

UNION CARBIDE

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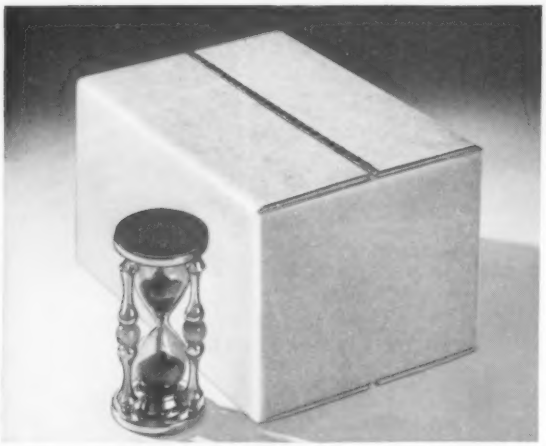
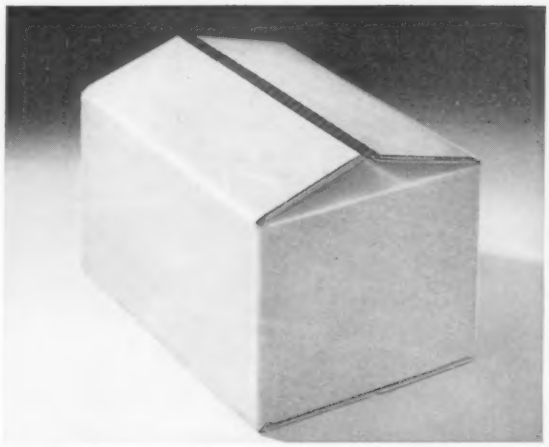
3 COMMON PROBLEMS IN CASE SEALING

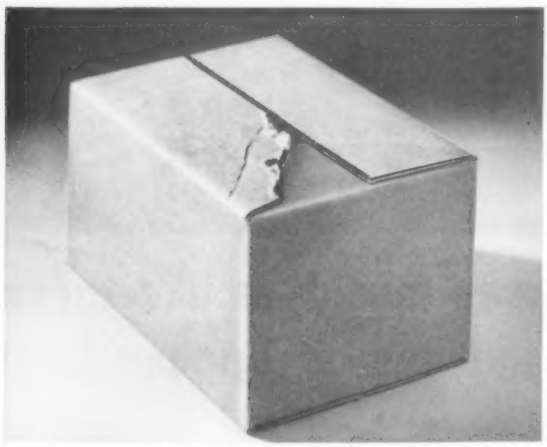
(and how the Arabol man helps you solve them)



THE ADHESIVE DRIES TOO SLOWLY—When this happens, unsealed boxes pile up and shipping schedules can't be met. Check your compression unit. Cases may be moving through it too fast. Or perhaps they're under insufficient compression. Then, there's the paperboard itself—it may be *damp*. In any event, see your Arabol man. He'll come up with an adhesive that suits the condition.



THE SEAL WON'T HOLD—We can list three possible reasons: (1) Your boxboard is soaking up the adhesive too fast. Solution: adjusting adhesive viscosity to suit your specific machine requirements. (2) Case content is too heavy. Solution: a stronger or faster drying adhesive. (3) Your sealed box is exposed to moisture. Solution: a water-resistant adhesive. Why guess? Ask the Arabol man.



THE SEAL IS TOO STRONG—Sometimes an adhesive can seal a case so tightly, you'd think only dynamite could blast it open. If the problem develops suddenly, check your paperboard. A change in the finish may be causing the adhesive to soak in too fast. One solution is an adhesive that provides less penetration. Another is to apply the adhesive via the skip or strip method. What you want is just the *right amount* of holding power—and the Arabol man will see that you get it.

THE BEST WAY to solve case sealing problems is to prevent them from happening. You can begin by contacting your Arabol man. His adhesive know-how can be a big help. So can his close contacts with machine and shipping case manufacturers. To give you a better understanding of how to select and use adhesives, send for our free booklet, "HOW TO BUY ADHESIVES—23 BASIC YARDSTICKS"

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14 PLANTS AND WAREHOUSES TO SERVE YOU ON A LOCAL BASIS

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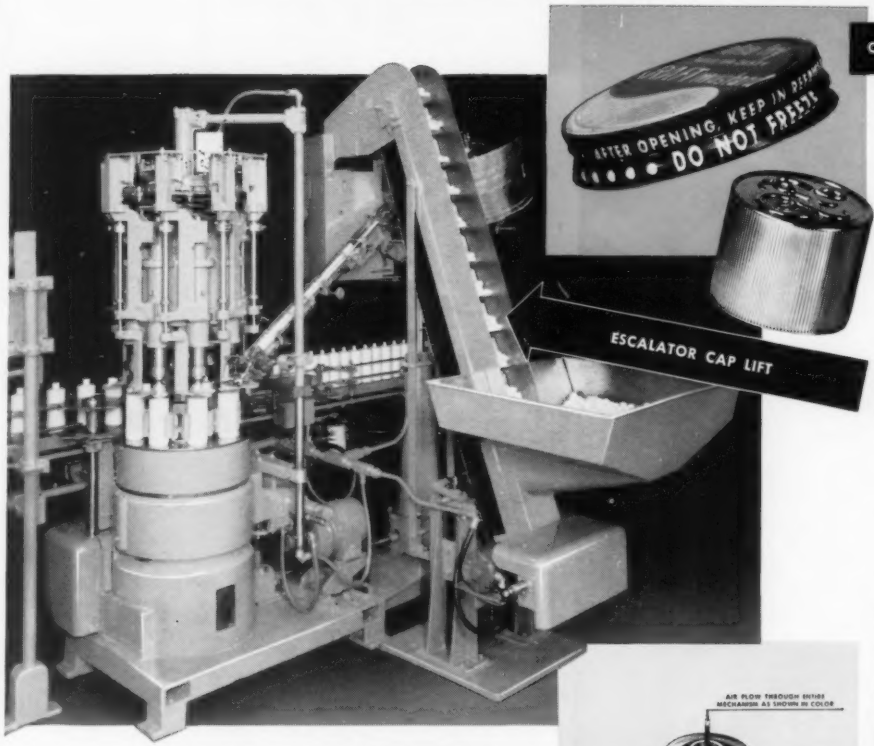
MOST ADVANCED CAPPING METHOD of this day and age



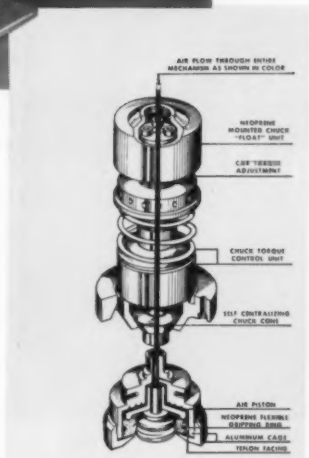
CAP ADAPTABILITY UNLIMITED

All types of turn-on closures, can be handled by the firm, yet gentle action of the unique air chuck.

ESCALATOR CAP LIFT

Supplementary aid does away with awkward task of dumping cap cases into hopper 6' above floor.

Applies metal, knurled, smooth, single or double shell caps and is especially well suited for handling the fragile molded types.



AIR CHUCK FLEXIBILITY

Receives caps in bulk quantities, sorts and feeds them in orderly array for "pick off" by rotating arms of capper. Models available to handle caps up to 89 mm.

STERLING CAP FEED

MONEY SAVING CONTAINER CONTROL

PNEUMACAP rotary capping machines include 2, 4, 6, and 8 head models. All feature the advanced design Pneumacap Air Chuck and Sterling Cap Feeders. When you add the Escalator Cap Lift you're as close to money saving automation as you can get today.

The air chuck alone is a major engineering triumph. It employs air pressure to squeeze a Neoprene ring so as to radially grip the cap. Feather weight design eliminates excessive mass, resulting in maximum sensitivity of torque control. Its adaptability is matched by its escalator lift and cap feeder team mates.

The PNEUMACAP is strong on container control, too—leaving nothing to chance. Get the complete details —write for the 8 page Capping Bulletin #146.

PNEUMATIC SCALE CORPORATION, LTD., 77 Newport Avenue, Quincy 71, Mass. Sales Offices: *New York; Chicago; Dallas; Rochester.* Agents: *Fred Todt Company at Los Angeles, San Francisco and Seattle. Rockwell Pneumatic Scale Ltd., Edgware Road, London, N. W. 2, England, O. R. M. A., Paris 8, France. Carbert Manufacturing Co., Division, Cambridge, Mass., Delamere & Williams Co., Ltd., Toronto.*

***PNEUMATIC**

Packaging and Bottling Equipment

Perhaps you need a completely new type of corrugated package, for a product that requires ingenious container design. If so, you'll benefit from Hinde & Dauch's *creative approach* to package engineering. Or maybe you use standard shipping boxes in great quantity. In that case, you can count on H & D's large volume capacity—more than six billion square feet per year—to keep you supplied for uninterrupted production.

Hinde & Dauch Division

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How to develop workable packaging specifications

By James J. Solomon,
Package Engineering Department,
Anheuser-Busch, Inc.,
St. Louis

The best possible package at the most economical cost can be obtained through the use of properly developed package material specifications, according to Mr. Solomon. Using a corrugated shipping container as an illustration, he discusses ten of the most important factors which the resourceful packaging engineer should investigate *before* preparing a specification. Telling why his company uses a dual system—general and specific—he lists the items which it feels should logically be included in each of these two specification types.

Without reservation, the most difficult, and often perplexing, problem facing the packaging engineer today is the writing of *workable* packaging specifications. A specification too strict in its requirements may leave one without supply sources; one not strict enough may lead to sub-standard containers. The "happy medium" is that desired—yet often that most difficult to attain.

We, at Anheuser-Busch, realize that the guesswork should be taken out of packaging and replaced with a workable system of packaging specifications. This is not only desirable to our company but to our suppliers as well, since they will then know precisely what we want, and expect, in our packaging materials.

This eliminates any questions or confusion that the supplier may have as to our packaging requirements. In a company such as ours which spends upwards of $50,000,000 per year on packaging materials, such a specification system is a must.

Lab And Field Tests Come First

A packaging specification is by general definition a written document which describes *in detail* all the requirements demanded of the package. In our company, the package engineering department develops all packaging specifications after extensive laboratory and field testing. The data accumulated in these tests is then summarized in written form and forwarded to our purchasing department for dissemination to present, or potential, supply sources.

When the purchasing department approves a supplier as a source (i.e., company reputation, financial stability, number of plants and their geographic location, etc.) and gives it a purchase order, the supplier is requested to furnish samples of the package in question (or materials which will be incorporated into the finished package). These samples go directly to our quality control department for extensive evaluation against the respective written package engineering specifications.

If the pre-shipment samples receive the "blessing" of the quality control department, the supplier is given permission to ship the lot of containers in question. Upon arrival at our plants, we take statistically selected samples from the

truck or rail car and make further tests. In this manner, a two-fold check is made of incoming container shipments.

FACTORS FOR CORRUGATED BOXES

Before a specification can be developed on a specific package, it is mandatory that the packaging engineer know *all* the performance requirements which will be demanded of the package in question. Ten of the most important of these factors are listed below and briefly discussed.

We have limited our discussion to corrugated beer containers for simplicity's sake. However, most of the factors listed would likewise apply to the many other packaging materials we use (folding cartons for canned and bottled beer, plastic-coated, solid-fibre returnable bottle cartons, etc.).

Means Of Shipping

1. How is the package to be shipped?

Will shipment be made via rail, truck, air, boat? Will the package be shipped to a domestic (interstate or intrastate) or a foreign market?

Our traffic and package engineering departments work hand in hand in obtaining answers to these and similar questions. Rail shipments, for example, normally demand a somewhat stronger container than those used for truck shipments—mainly because of geographic distances covered. Export shipments are normally much harder on packages than domestic shipments. Military shipments must comply with rigid specifications as to the container and its pallet positioning.

The packaging engineer must know precisely *where* and *how* the package is to be shipped before he can develop a suitable packaging specification.

Study Freight Regulations

2. What freight regulations govern the shipment of the package?

If a package is to be rail shipped and the shipper does not wish to underwrite damage claims, it must meet all requirements of the *Uniform Freight Classification*, "Ratings, Rules and Requirements," plus all applicable supplements. All of our corrugated shippers, which are shipped by rail, meet the provisions of Rule 41, or are authorized under separate package numbers.

This rule, plus its supplements, regulates certain aspects of the shipper such as maximum allowable contents weight, box maker's certificate, package number if applicable, minimum Mullen requirements, interior packing, etc. It is absolutely mandatory that the packaging engineer know *what restrictions* are placed on the package by the transportation carrier.

James J. Solomon is a graduate of St. Louis University with a B.S. degree in chemistry as well as an M.B.A. From 1951 to 1956 he did product development work in the general engineering laboratory of Bemis Bro. Bag Co. In 1956 he joined the package engineering department of Anheuser-Busch to do package design and specification development. Mr. Solomon is a professional member of the Package Institute, and belongs to TAPPI and American Chemical Society.

Be Realistic With Suppliers

3. What are the supplier's limitations?

A package specification is of no practical use if it requests of the supplier something it is unable to furnish. Normal dimensional tolerance, for example, on a corrugated container produced on a conventional printer-slotter is ± 1/16 in.

To ask for dimensional tolerances any more rigid than this is being unrealistic with your supply sources. The packaging engineer must, therefore, have a *working knowledge* of the supplier's manufacturing facilities and its production limitations.

Look At Set-Up Method, Speed

4. How is the package to be set up in the plant prior to packing, and at what speeds will this set-up take place?

A package which is hand set up usually requires different properties than one which is set up on high-speed automatic machinery. If a corrugated shipper is improperly scored, it usually can be set up manually without too much difficulty. If the same box were run across high-speed production equipment such as we use, a major machine jam-up would probably result.

Various corrugated bottle containers used by our company have a series of open rectangles printed on the bottom outer flaps, into which the staples must be placed by the glass manufacturer (for one-way or new, returnable bottles), or by our own staple machine operators (for returnable bottles). This assures uniform set-up and eliminates shoddy, haphazard set-up methods. Since box set-up methods greatly affect a container's functional aspects, it behooves the packaging engineer to specify a box which is *set up easily* and *uniformly*.

Determine Method Of Closure

5. What is the method of closing package after filling?

The packaging engineer must know just how the package is to be closed after filling, i.e., tape seal, stapling, adhesive, etc. Various closure methods make varying demands upon the package in question. For example, at one time, all can containers we shipped to domestic markets were closed with an adhesive called "easy-open."

This adhesive is a high-shear-strength composition possessing low tensile-strength qualities. It results in closures adequate strengthwise to withstand shipment without rupture, but causing little effort to open on the part of the consumer. Packaging specifications were necessary, therefore, not only

on the shipper but the adhesive as well—since the successful operation of each was dependent upon the other.

Viscosity of this adhesive plus its set-up time are only two factors determining the glue seal obtained. On the other hand, the linerboard finish greatly affects the glue application. Thus, if the liner finish is not controlled in the packaging specifications, an improper seal results.

Know Plant Handling Practices

6. How is the package to be handled in the plant?

Will the package be direct loaded into the transporting vehicle or will loads be palletized? Will fork-lift trucks handle palletized loads and, if so, for what distances? These and other similar questions must be answered by the packaging engineer before suitable packaging specifications can be written.

Our materials handling engineers work hand in hand with the packaging engineers to determine what properties a package will need to lend itself to automatic palletization, fork-lift truck handling, automatic tray-conveyor handling between floors, etc. Labor rates in the brewing industry are quite high and are continuing to spiral. For this reason, filled cases are handled with a minimum of manpower with emphasis on automation. These containers are being handled faster today than ever before—making mandatory a stable, non-shifting pallet load.

All boxes we use for bottled and canned beer must meet a rigid, anti-skid packaging specification (evaluated in the laboratory). This assures us of needed pallet load stability. It is well for the packaging engineer to attempt to correlate the functional aspects that will be demanded of a box in the plant, with the physical tests conducted on the package in the testing laboratory.

Compression Strength A Factor

7. What performance properties are demanded of the package in the wholesale and retail outlets?

Many of our wholesalers also handle cases on pallets with fork-lift trucks and, in addition, stack pallets one upon the other so that they occupy a minimum of warehouse space. This means that the box must withstand rather high compression loads and, of course, here also they must resist sliding from the palletized loads.

Such rigorous treatment will demand that the packaging engineer carefully specify such items as direction of corrugations, Mullen test, etc. The inside height of boxes for cans is critically controlled such that the can helps support the load when under compression. Cases must be legibly printed with a product description plus a numerical code for easy identification of inner contents. This is very important to the large wholesaler who handles a multiple variety of products.

Retail outlets make various demands upon the package which must be reflected in the packaging engineer's specifications. They demand that the containers be printed with inks that are rub-resistant, to eliminate transfer to the clothes of their employees or of the consumer during carry-out.

Handholes in containers for returnable bottles must be reinforced with rayon tape in order to eliminate bottle breakage resulting from handhole pull-out. Cases should lend themselves to ease of opening and yet *shall not* be adversely affected by storage in damp, cold, refrigerated coolers. Since the good will of your wholesalers and retailers helps determine your sales success, their wishes and desires concerning your packages should be heeded.

Board Finish Is Important

8. What are the physical requirements of the package, with which merchandising, advertising, and sales are concerned?

The package is no longer just a media of transportation as it was 50 years ago. Today, it often influences the consumer to buy your product over that of your competitors. It helps advertise, pro-

CHART I

Items Listed In Master Corrugated Container Specification

1. Composition of Board (exclusive of fabrication into containers)
   - A. Test Mullen (lb./sq. in.).
   - B. G. E. puncture (units, with and across corrugations).
   - C. Hinde & Dauch flat crush (lb./sq. in.).
   - D. Caliper (in.).
   - E. Liner weights in relation to test Mullen desired.
   - F. Type corrugating medium and liners, i.e., semi-chemical, virgin kraft, etc.
   - G. Brightness of outer liner (photovolt).
   - H. Adhesion of liners to corrugating medium (per cent fibre tear desired).
2. Fabricated Containers
   - A. Dimensions. Methods of measurement and allowable minimum and maximum tolerances.
   - B. Board warpage allowed on set-up container.
   - C. Cutting of container edges and slots.
   - D. Scoring. Type of scoring desired, overscoring and underscoring and rejections of same.
   - E. Slots. Width, depth, and alignment with respect to body scores.
   - F. Lithography and printing. Proper register, clear and clean printing, color standards, etc.
   - G. Markings. Boxmaker's certificate, package number if applicable, specification number, date fabricated, liner and corrugating medium weights, etc.
   - H. Flap overlap allowed—both bottom and top flaps.
   - I. Manufacturer's joint—type (glued, stitched), placement of staples, fibre tear on glued joint, etc.
   - J. Ink rub resistance—method of testing and end results desired.
   - K. Pack. Incoming knocked-down containers bundled in pre-determined manner, palletized, etc. Depends upon materials handling equipment and procedure for incoming materials.
   - L. Anti-skid properties of container. Test procedure and results demanded. Treatment also may be specified.
   - M. Pre-shipment sampling. Instructions for submitting production random samples to quality control of incoming container shipments.

mote, and sell the contents, and, for these reasons, must "look its best" to the consumer.

A corrugated box with a dull finish linerboard distracts from the overall appearance of a mass display. It is better to have a display of containers with a consistent linerboard brightness. For this reason, our specifications demand such a minimum brightness. In a like manner, the brightness of Budweiser white ink is specified as acceptable *only* when within a certain range. Color standards on Budweiser red and Busch Bavarian blue are currently under study and will be specified as a minimum and maximum color hue.

The linerboard and its relative roughness greatly determine how an ink will appear when placed on the board by the box manufacturer. We, therefore, specify a water-finish board which lends itself better to printing than dry-finish boards which tend to act with a blotter effect upon inks.

Check Need Of Special Coating

9. What functional qualities are needed to meet the consumer demands?

The consumer's demands on a package are perhaps the most exacting and should be controlled very carefully in a packaging specification. He demands a package which is easily handled and carried, in most instances by a handle. He wants one easy to open for contents availability, but not so easy as to accidentally discharge and damage contents. He wants a clean, sanitary carrier which he is not ashamed to take into his home.

Our solid-fibre, returnable-bottle container used in our new Tampa plant, for example, is plastic coated both inside and out to resist scuffing and the infiltration of dirt and dust into the board. A carton washing machine is even being considered for this plastic-coated case, which would remove any foreign material from the coated board and assure a sanitary, clean package for the consumer.

Keep An Eye On Costs

10. What does the package cost?

Last, but not least, the packaging engineer must concern himself with the cost of the package. Packaging to a firm such as ours is "big business" in itself. If we were to "overpackage" our products and give cost no consideration, profits would necessarily decline because of the higher cost of doing business.

In the packaging field it is a cardinal rule to never sacrifice product protection in lieu of package cost savings. While this is true, a smart and resourceful packaging engineer can often make package modifications without affecting contents protection, and at a substantial cost savings to the company.

Our company, as an example, pioneered the use of can cases with cut-back flaps (i.e., regular-slotted containers with top flaps which are gapped and do not meet in the center). Our test shipping data and arguments before the *Uniform Freight Classification* committee were such that this above innovation was given approval for rail shipment under appropriate package numbers, and now is being used successfully by most breweries. This is an example of maintaining adequate product protection at a savings in packaging materials of several hundred thousand dollars per year.

DEVELOP SPEC FROM DATA

The above ten factors are given as examples and are not intended to be all inclusive. They depend to a large degree upon the nature and size of the business and its distribution methods.

Once the packaging engineer has answered the above questions and those similar in nature, he has compiled a lengthy set of data which must be combined in a certain semblance of order.

Use Two Types Of Specs

We employ two separate and distinct types of specifications, which we call "general" and "specific." General specifications are broad in nature and govern a whole set of packages similar in nature. Corrugated shippers, glass bottles, metal cans, paperboard bottle and can folding cartons, for example, all have general specifications which each individual package in the group must meet. For example, to specify on each individual corrugated box specification all the various items desired, would mean much repetition of material and a specification manual much too lengthy.

The logical approach is to find all those items common to corrugated containers and combine them into a *general* corrugated specification. Such items as inside dimensions, layout drawings, etc., will then form the *specific* specification for a certain corrugated shipper.

To illustrate this important feature of specification development, Charts I and II show those items which we feel should logically comprise general and specific specifications, respectively. Corrugated

(Continued on Page 112)

CHART II

Items Listed In Specification For Specific Container

1. Specification number and date issued.
2. Test Mullen (lb./sq. in.).
3. Inside dimensions: given as length, width, and height respectively.
4. Markings. Specific package number under which container is shipped, placement of boxmaker's certificate, etc.
5. Manufacturer's joint. Glued or stapled.
6. Area of blank. Given in square feet of board utilized in container.
7. Container detail drawing. Layout of container showing vital dimensions as derived from inside dimensions desired.
8. Compliance with general specification. Statement to the effect that in addition to factors specified in the specific specification, container must also meet all applicable aspects of the general specification.

Accurate fill is very important to the packager because of government regulations and the fact that overfilling is costly. According to Mr. Stigler, proper use and maintenance of piston-filling equipment can reduce inaccuracies to within plus or minus one-tenth fluid ounce per container. Pointing out that component wear and preventive maintenance are very dependent on process conditions, he treats this subject in two sections—mechanical and process considerations. Describing the actions of a typical vertical piston filler, he pin-points common mechanical trouble areas and suggests preventive measures and remedies. He stresses the importance of the relationship of product type to port size and piston diameter, as a must for accuracy.

Factors affecting accuracy of vertical piston fillers

By Joseph T. Stigler,
Manager, Filler Product Engineering,
The Pfaudler Company,
Division of Pfaudler Permutit, Inc.,
Rochester, New York

Every packager who uses filling equipment realizes the importance of filling accuracy. Minimum fill requirements are established by government regulations for commercial products, and overfilling can be extremely expensive because of the amount of product lost either in the container itself or outside—as a result of spillage.

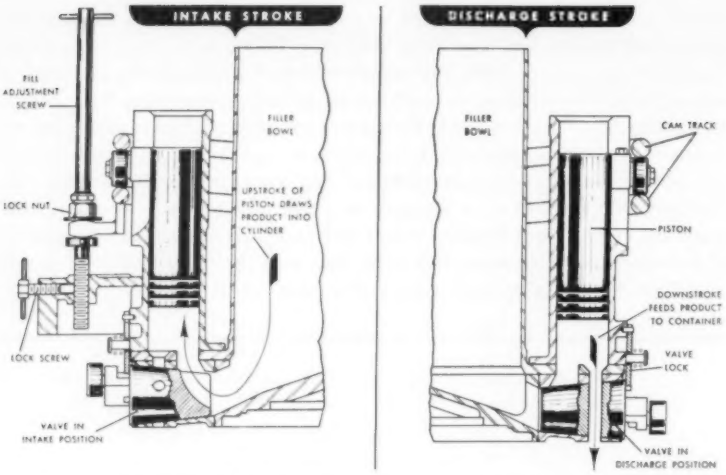
Proper use and maintenance of piston-filling equipment can reduce filling inaccuracies to the point where they are negligible, that is, to within ± 0.1 fl. oz./container. Accuracy within these limits is dependent not only on the mechanical characteristics of the filler, but also on the nature of the product being filled. Filling a heavy garnish such as dog food, for instance, places much more strain on filler components than a relatively light, viscous product such as motor oil.

Because component wear and preventive maintenance are so dependent on process conditions, we will discuss this subject in two sections: (1) Mechanical considerations—in which common trouble areas are pinpointed, and suggestions made as to preventive measures and remedies; and (2) process considerations—in which you can select the particular conditions that affect your own operation and thus know what to expect from your equipment.

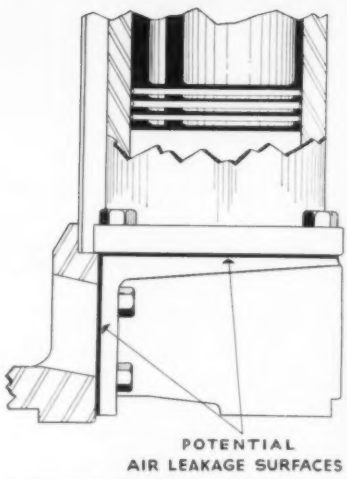
MECHANICAL CONSIDERATIONS

A vertical piston filler consists essentially of a bowl, body, pistons, cylinders, valves, and actuating mechanisms. The moving components are subject to wear, but an adequate preventive maintenance program detects vulnerable spots and drastically reduces filling inac-

Joseph T. Stigler participated in the I.C.S. course in mechanical engineering and attended an extension course in design at Cornell University. Prior to joining Pfaudler 12 years ago, he was with American Can Co. in Geneva, N.Y. and Newark, N.J., and was associated for four years with Amertorp Corp., U.S. Naval Ordnance Station, Forest Park, Ill. At Pfaudler, Mr. Stigler has been concerned with design and development of rotary piston fillers.



1 FILLING AND DISCHARGE ACTIONS of typical vertical piston filler. Intake: Piston roller in cam track raises piston, drawing product from filler bowl through valve intake port into cylinder. Valve roller on cam rotates valve so intake port closes, discharge port opens. Discharge: Piston is lowered, forcing product out of cylinder through discharge port into package. Second valve cam returns valve to intake position as piston begins its upward stroke.



2 WHEN AIR LEAKS occur at joint of cylinder and machine, or valve body and bowl base, air enters cylinder, causing underfilling. Joints must be checked for cracked sealing compound and for loose hold-down bolts.

curacies. The rate of wear encountered usually depends on the amount of on-line service and the type of product being filled.

Filling and discharge actions of a typical vertical piston filler are shown in Fig. 1. The piston roller operating in the cam track first raises the piston and draws the product from the filler bowl through the valve intake port into the cylinder. Action of the valve roller on the valve cam rotates the valve so that the "intake" port closes off and the "discharge" port opens.

The downstroke of the piston forces the product out of the cylinder through the discharge port into the container. A second valve cam then returns the valve to the intake position as the piston begins to travel upward on its intake stroke.

Roller Wear

Piston rollers are under stress during both the fill and discharge phases of the cycle. Thus, wear is inevitable regardless of the type of piston filler employed. Depending on the type of product being filled, a set of rollers may last a full season, a half season, or even less.

Rollers on modern piston fillers are made of metal, such as steel or bronze, or of phenolic. Phenolic is used to prevent cam track wear and to help reduce noise. Replacing phenolic rollers is a relatively simple and inexpensive procedure, whereas a worn cam track inevitably results in filling inaccuracies, and replacement is a major expense.

"Flats" will develop on phenolic rolls if they fail to rotate due to improper clearances (the manufacturer's error), or introduction of foreign material between the roller and stud (a maintenance oversight). If a "flat" *does* develop, the roller will fail to actuate the piston properly, and the roller will have to be replaced.

Rotate Stud 90°

On the other hand, when the roller stud becomes worn on the bottom (due to continuous lifting against the weight of the piston) the stud can be *rotated* 90° by either loosening or tightening it a quarter of a turn, and relocking it into position. Remember that the wear will not affect filling accuracy unless it is at the *bottom or top* of the stud where it can cause "slop" in the vertical plane.

With machines designed so that the piston is above the container, normal wear on the roller circumference can be somewhat compensated for by adjusting the upper cam rail which controls the beginning of the piston down—or filling—stroke. The upper rail should be adjusted so that clearance between it and the piston roller is about 0.005 in. However, this accuracy need be maintained only at those positions on the cam track which correspond to points where the valves open and close.

When installing a new roller, care should be taken to assure that the set screw is tightened sufficiently to prevent the stud from coming loose during operation of the machine. All studs should be checked periodically to assure tightness.

Cylinder Leakage

Accuracy of fill and smooth operation of piston fillers depend largely on the finish and proper fit of the pistons. A liquid seal is maintained between the piston and cylinder wall; but, as components wear, the additional clearance may permit product to leak past the piston and cause underfilling.

This type of leakage can be detected by simple visual inspection. "O" rings are sometimes added to the piston to compensate for wear, but, in most cases, the "O" rings must be replaced frequently. A

more satisfactory, if more expensive, remedy is to have the cylinder honed out and oversized pistons installed.

Should a piston or cylinder become nicked or scratched, swaged metal should be removed by using a very fine file or a fine grade of emery paper. Failure to do this can cause severe scoring.

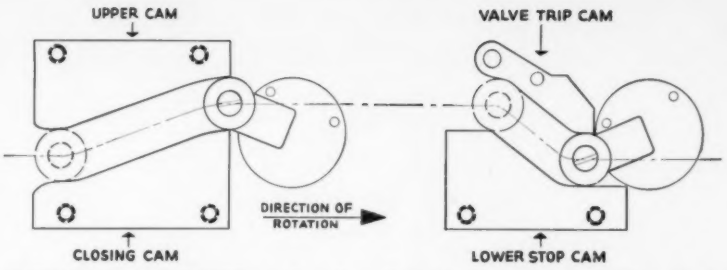
Watch For Air Leakage

Of more importance than excess leakage between the piston and cylinder, is air leakage at the sealed faces between filler components. (See Fig. 2.) A sealing compound is used on these faces, but air leaks will develop if the compound cracks or if the hold-down bolts loosen. When a leak occurs where the cylinder is bolted to the machine, or where the valve body is bolted to the bowl base, air will enter the cylinder on the intake stroke of the piston and underfilling will result.

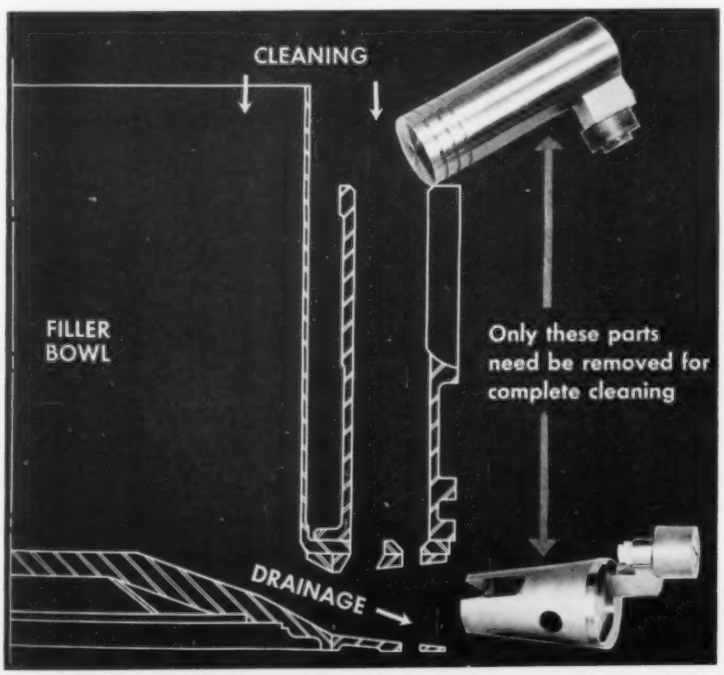
To determine whether a seal leak exists, fill the bowl with hot water (cold water could be used, but hot more nearly simulates operating conditions) and let the machine stand for at least fifteen minutes. If any drops of water appear around the joint faces, resealing is necessary. Note that it is *not* necessary to operate the equipment to perform this inspection.

Care Of Valves

The function of the piston-filler valves is described in connection with Fig. 1. The valves and valve bodies should receive the same care and attention as pistons and cylinders.



4 WEAR CAN BE EXPECTED on valve roller, roller stud, and valve trip cam—roller and stud receive hardest wear of any parts on filler. Bushings, often used between roller and stud to reduce rate of wear, should be inspected periodically, and must be replaced when necessary.



3 DURING ROUTINE CLEANING AND MAINTENANCE, valves and pistons must be handled carefully, as leakage is, perhaps, caused primarily by direct physical damage. They should *never* be "batch" washed, but cleaned individually on wood tables, to prevent damage.

Perhaps the primary cause of valve leakage is direct physical damage caused by dropping during routine cleaning or maintenance. Valves and pistons should *never* be "batch" washed. They should be removed to a special wooden table or racks, which will prevent damage due to impact.

Tapered plug valves (see Fig. 3) are used with certain piston fillers. To maintain a full seat, in the event that these valves become worn or marked, hand lapping is necessary.

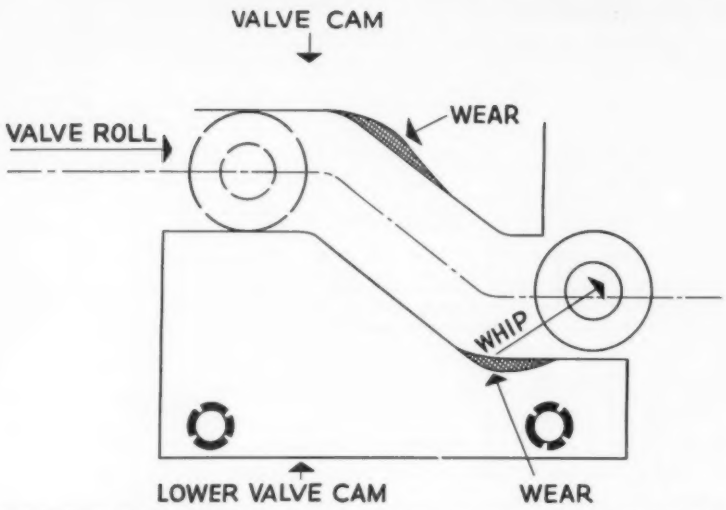
A thin coating of fine lapping compound is applied on the entire wearing surface of the valve plug. The plug is then placed into the valve body. Using light pressure, the plug is rotated back and forth through a full 360° arc, to simulate the normal motion of the valve when in operation. When the hand lapping operation is complete, all compound *must* be removed and a light coat of lubricant applied.

In the event of physical damage such as marks or scratches, swaged metal must be smoothed down with a fine file until the original part contour has been re-established.

Valve Rolls And Trip Cams

Action of the valve roller against a trip cam opens the valve. (See Fig. 4.) Because this action is continuous, wear can be expected on the roll, the stud, and the cam itself—in fact, the valve roller and stud receive the hardest wear of any parts on the machine.

Oftentimes, a bushing is provided between the roller and the stud to absorb some of the punish-



5 MINIMUM CLEARANCE between upper and lower valve cams must be maintained to minimize chances of wear (shaded areas) developing on cams by action of metal rollers on cams. Wear makes roller "whip," causing partial valve closing, back pressure, inaccurate fill.

ment. These bushings should be inspected periodically and be replaced when necessary. The valve-roller stud *cannot* be rotated 90°, as can the piston roller stud, because its wear is not restricted primarily to one surface.

Keep Proper Cam Clearance

Valve rollers are usually made of metal because of the constant stress to which they are subjected. Action of the metal roller against the trip cam causes the cam to wear in the places shown in Fig. 5. As a result of this wear, the valve roller will "whip," thus causing partial valve closing, back pressure, and inaccurate fill.

To minimize the opportunities for this condition to develop, it is necessary to maintain minimum clearance between the upper and lower valve cams; also, to inspect the cams frequently and replace them before wear becomes excessive.

PRODUCT CONSIDERATIONS

Valve Port Sizes

Port sizes for most products have been determined by factory testing and experience. Size will vary with the type of product being filled, length of filling stroke, and required rate of fill.

Some manufacturers make valve ports to a maximum size and then reduce the opening to be consistent with operating conditions, by using reducing nozzles. These nozzles function quite satisfactorily with fairly viscous products; however, for thin products, run-off and dripping from the nozzle may result in alternate underfilling and overfilling.

Product Cushion

Cushion is the amount of product remaining under the piston at the end of fill—usually about 1/16 in. when the valve is closed. Generally speaking, manufacturers try to keep the amount of cushion at a minimum to prevent the possibility of product compression during the fill stroke.

There are times, however, when minimum cushion cannot be maintained because of the size of garnish, that is, strawberries, some soups, and so on. In such instances where the garnish could be crushed against the bottom of the cylinder, the bottom of the piston stroke must be raised. Under these circumstances, proper sizing of the port and attention to rated speeds are very important to maintain filling accuracy.

TABLE
Algebraic Relationship Between Piston Diameter And Volume Of Product It Delivers (For Piston Type Fillers)

Piston Diameter (in.)	Product Volume (fl. oz./1-in. stroke)
1¾	1.33
2	1.74
2¼	3.29
3	3.91
3¾	6.12
4	6.96
5	10.88
6	15.66
7	21.31

Rated Speeds

Filling speeds of vertical piston fillers are affected by a number of considerations. First is the number of stations available on the machine. For instance, a 14-stage unit will fill baby food at a rate up to 375 5-oz. containers/min., a 21-station machine will fill the same product at a rate up to 550 containers/min., and a 35-station machine will operate at 800, or more, containers/min.

Operating capacity also will vary depending upon the nature of the product being filled, the size and shape of the container, product viscosity, head space required in the container, and the speed of other machinery in the line.

More specifically, cans can usually be filled more rapidly than jars or fibre containers. High speeds are obtainable with smaller sized containers, with those having open mouths and a cylindrical shape.

Don't Go Over Rated Speed

Product compression and consequent atomization result from running the filler beyond rated speed. The port size is only a fraction of the total area of the cylinder bottom. Only a specific volume of a product with a pre-determined consistency can be forced through this port per unit of time. Increasing the volume per unit of time is accomplished at the risk of alter-

(Continued on Page 112)

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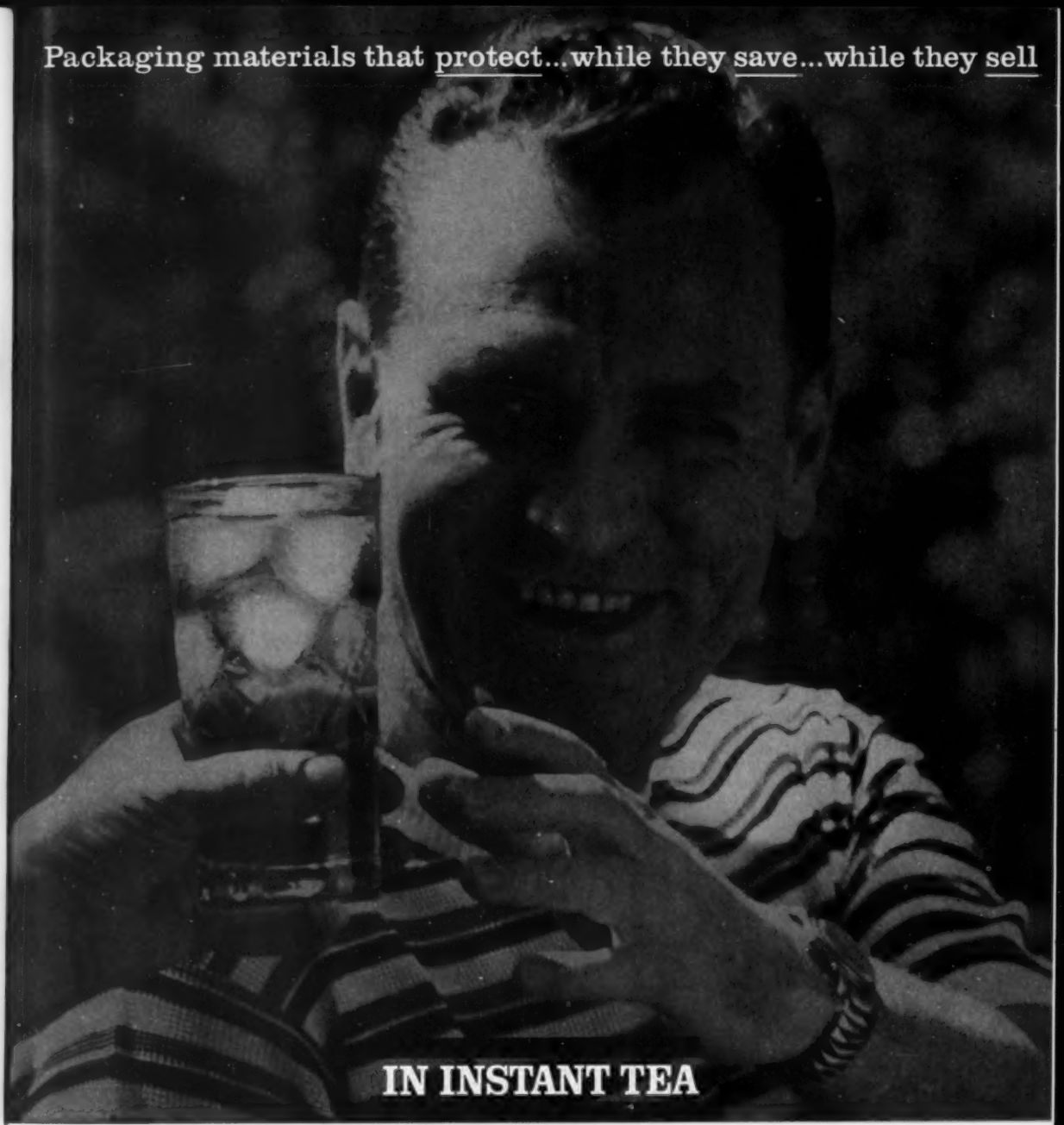

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Effect of packaging on palatability of frozen turkey fryer-roasters*

By J. D. Winter, Shirley Trantanella, and Milo H. Swanson,
Institute of Agriculture, University of Minnesota, St. Paul,

and W. B. Ackart,
Union Carbide Plastics Company,
Bound Brook, New Jersey

Summary

- Turkey fryer-roasters were packaged, frozen, and stored at approximately 0° F. (−17.8° C.) for 5, 8, and 11 mo.
- Packaging materials used were unmodified polyethylene, two experimental types of shrinkable film, cellophane coated with polyethylene, and a commercial vinylchloride-vinylidene chloride copolymer film.
- There were no major differences in palatability among any of the samples stored for the same length of time, although wide differences in the rate of oxygen permeability of the packaging materials are known to exist. Some of the differences in palatability were significant at the 1-per cent level, but the differences were not large.
- All of the packaging materials were very satisfactory, with respect to palatability of the frozen product, for storage periods up to 8 mo. There was a distinct and very uniform drop in palatability scores between the 8- and 11-mo. storage periods.
- Color and appearance of all samples at all storage periods, both before and after thawing, were good.
- There was no apparent correlation between palatability scores and the TBA values of abdominal fat for the same storage periods. However, samples analyzed after 11 mo. gave higher TBA values than those analyzed after 8 mo., which corresponds to the results represented by the taste-panel scores.

This study was designed to compare the palatability of stored turkey fryer-roasters packaged in unmodified polyethylene film with that of samples packaged in two experimental types of shrinkable film, in cellophane coated with polyethylene, in aluminum foil coated with polyethylene, and in a commercial two-dimension shrinkable, vinylidene derivative film; and to determine the 2-thiobarbituric acid (TBA) value of abdominal fat from the samples prior to cooking.

Previous experiments at this station *(8, 9, 10, 11, 12, 14)* have shown that the palatability of frozen beef, pork, and Lake Superior herring fillets in storage may be significantly affected by the type of packaging material used. Similar results with beef and pork have been re-

*Paper No. 4162 Scientific Journal Series, Minnesota Agricultural Experiment Station. This study was partially financed by a grant from Union Carbide Plastics Company, Division of Union Carbide Corporation.

ported during recent years by various investigators such as McCoy, Cook, and Hayner *(3)*, Simpson and Chang *(5)*, and others.

On the other hand, Wills, *et al* *(7)* reported no appreciable differences in palatability ratings of frozen poultry fryers, attributable to packaging when stored for 3, 6, and 9 mo. at temperatures of 10° F. (–12.2° C.) and lower, in metal containers and in waxed cartons. Composite breast and thigh muscles, gizzards, and livers were used. Appreciable losses in oxygen and corresponding increases in carbon dioxide content during the storage period were noted in the sealed metal containers.

Likewise, Winter and Trantanella *(13)*, using packaging materials similar to some of those used in this study, found no differences in the palatability of frozen broiler chicken thighs, attributable to packaging after storage for periods up to 13 mo. Klose, Hanson, and Lineweaver *(2)* noted that aluminum foil, polyethylene, and cellophane gave essentially equivalent protection to turkey steaks stored at 0° F. (–17.8° C.) for 3, 6, and 12 mo.

James D. Winter received his B.S. and M.S. degrees from the University of Minnesota, where he was associate professor until he retired this summer. In 1957 he received the achievement award from the National Institute of Locker and Freezer Provisioners, of which he is an honorary member. Mr. Winter is a member of Gamma Sigma Delta, Sigma Xi, and a charter member of Phi Tau Sigma. A member of Institute of Food Technologists, he has authored a number of technical papers on packaging frozen foods.

Shirley R. Trantanella was graduated with B.S. and M.S. degrees in home economics from the University of Minnesota where she is now an instructor, department of horticulture. She is a member of Phi Upsilon Omicron, Sigma Delta Epsilon, and Mortar Board. Miss Trantanella also holds membership in American Home Economics Association and the Minnesota section of Institute of Food Technologists.

Milo H. Swanson holds B.S., M.S., and Ph.D. degrees from the University of Minnesota where he currently is associate professor in the Department of Poultry Husbandry in charge of teaching and research in the field of poultry products technology. Dr. Swanson is a member of the Institute of Food Technologists, Poultry Science Association, Phi Tau Sigma, Sigma Xi, Gamma Alpha, and Gamma Sigma Delta.

Watson B. Ackart received his B.S., M.S. and Ph.D. degrees in bacteriology from Rutgers University. After six years with the research and development division of Merck & Company, Inc., he joined Union Carbide Plastics Company and is currently a development associate in the packaging division of the development department. Dr. Ackart is a member of Sigma Xi, Society of American Bacteriologists, and Institute of Food Technologists.

MATERIALS AND METHODS

No weight records were taken because previous studies with similar packaging materials *(8, 13)* have shown that no appreciable change in weight occurs under experimental conditions similar to those used in this test.

Selecting And Handling Turkeys

The birds were fryer-roasters, commonly known as broilers, averaging about 6 lb. eviserated weight, and obtained from one original source through a commercial processing firm. They were processed under commercial conditions, including subscalding at 140° F. (60° C.) and chilling in ice slush. On the day following processing, the eviserated birds were delivered in an ice pack to the laboratory where they were packaged immediately and then frozen.

Packaging Materials

The following film materials were used, all in bag form:

Lot	Packaging Material Identification
A	0.004-in. one-dimension shrinkable polyethylene;
B	0.002-in. unmodified polyethylene, made from Bakelite resin DYNH-3;
C	0.00035-in. aluminum foil coated with 0.0014 in. polyethylene;
D	300 gauge (0.0009 in.) cellophane coated each side with 0.001 in. polyethylene;
E	0.0015-in. shrinkable vinyl chloride-vinylidene chloride copolymer;
F	0.0015-in. experimental two-dimension shrinkable vinyl film.

Samples used for reference purposes were packaged in Material E and overwrapped in 0.0015-in. aluminum foil. (Lot G.)

The shrinkable films had a normal shrinkage of 30 to 40 per cent, when used within a few months' time after manufacture.

Packaging Methods

Each bird was packaged separately in a bag measuring approximately 10x17 in. Excess air was evacuated by use of standard commercial equipment. After sealing with Vac-Tie fasteners, all films except the 0.002-in. polyethylene were dipped in water maintained at approximately 190° F. (87.8° C.) for 2 to 3 sec.

Freezing And Storage Temperatures

The birds were frozen in a blast freezer at –30° to –35°F. (–34.4° to –37.2° C.) and stored at approximately 0° F. (–17.8° C.). The reference samples were stored at approximately –15° F. (–26.1° C.).

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TBA Analysis Of Abdominal Fat

The procedure for determining the TBA values for rancidity was that developed by Turner *et al* (6) with certain modifications to adapt the method to turkey fat. Samples of abdominal fat were removed from each carcass prior to roasting. These were frozen and stored in individual polyethylene bags to await the TBA analyses which were made within a short time after the samples were taken.

Each sample was rendered in a tube for ½ hr. in a boiling water bath, following which the liquid fat portion was centrifuged to separate the fat and water phases. Duplicate samples of the upper fat layer were then treated according to the following procedure:

Approximately 1 gm. of rendered turkey fat was accurately weighed into a 50-ml. centrifuge tube. Following the addition of 5 ml. of 20-per cent trichloroacetic acid in 2*M* phosphoric acid and 10 ml. of 0.01*M* 2-thiobarbituric acid (Eastman Kodak), the tube and its contents were heated with occasional stirring in a boiling water bath for 30 min. Then the tube was chilled in an ice-salt bath for 30 min. to solidify the fat.

After removal of the solid fat layer, 30 ml. of solvent containing a mixture of 2:1 iso-amyl alcohol-pyridine were added to the aqueous layer. Extraction was accomplished by shaking the tubes vigorously for 2 min. and then centrifuging for 10 min. in a clinical centrifuge to break the emulsion. The color of the clear solvent extract was measured with a Coleman Model 14 spectrophotometer at 538μ against a solvent blank. Final TBA values were adjusted to a sample size of 1.0000 gm. of rendered fat.

Defrosting

The birds were thawed in their wrappings in a household refrigerator at 39° to 42° F. (3.89° to 5.56° C.) for about 53 hr. before cooking was started.

Appearance Evaluation

The birds were observed at each judging period, after thawing and prior to cooking, to determine whether there was evidence of undesirable changes in appearance.

Cooking

Two single-oven electrical ranges of identical model were used for

On this page...

6 new ways to make a good packaging set-up a better one

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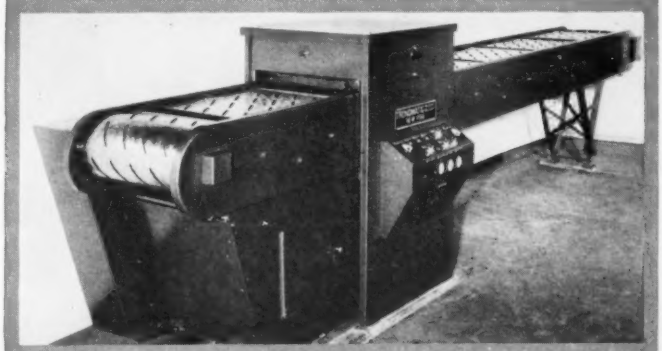
NEW **FLANGE FORMER** moves 80" to 400" per minute, makes 90° or 180° folds on any commonly used thermoplastic. Variable speed drive and positive dual thermostatic heat control assure smooth folding, whatever the speed. Edge being formed is heated, top or bottom, at all stages through forming die. Will fold parts up to 14" wide.



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NEW **VACUUM FORMERS** combine with other Tronomatic machines in automated operations to let you do everything from forming to heat sealing to trimming to stacking finished parts. Standard models: 30" x 30", for skin packaging... single-station machines from 11" x 22" to 48" x 72"... advanced rotary units. Custom-tailored equipment also available.

NEW **EXPANDABLE POLYSTYRENE MOLDER** delivers up to 16" stroke, handles parts up to 40" high. Special mold mounting permits full use of "daylight," speeds loading, eliminates hazards of working "in the press." Connections to air, water and steam only ones needed. Five platen areas available, from 24" x 36" to 49" x 73". Can be fully automated, if desired.

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The case of the kumquat canner's confusion

FEARLESS FULLER: Are you familiar with lines, Miss Watson?

MISS WATSON: Well, I've listened to quite a few clever ones in my day.

FEARLESS FULLER: I happen to be talking about canning lines not men's lines.

MISS WATSON: I imagine this must have something to do with your latest case.

FEARLESS FULLER: Yes, it does. I call it The Case of the Kumquat Canner's Confusion.

MISS WATSON: The kum-what?

FEARLESS FULLER: Kumquat. It's a sort of citrus fruit.

MISS WATSON: Why, with a name like that it's no wonder he was confused. But what was his problem, Fearless?

FEARLESS FULLER: Oh, it varied. His main trouble was that he wasn't using Fuller adhesives. As a result, sometimes his labels wouldn't stick properly. Other times, his cases would pop open during shipment.

MISS WATSON: He was really becoming unglued, huh, Fearless?

FEARLESS FULLER: Yes, you might say at times he didn't

MISS WATSON: I suppose happily about that time you entered the scene.

FEARLESS FULLER: That's right. Fortunately I was able to prescribe Fuller Adhesives to meet his every need. Fuller's 1303 for labeling and 176 for case sealing. Now his adhesive troubles are over and the case is solved.

MISS WATSON: Oh, Fearless, you're wonderful.

FEARLESS FULLER: Elementary, Miss Watson. A Fuller man always knows the solution to adhesive problems.

Your Fuller man is ready with the correct solutions on any adhesive problems for you, too. Contact your nearby plant.

H. B. Fuller Co.

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TABLE I

Palatability Scores Of Frozen Turkey Fryer-Roasters Stored In Various Sealed Packaging Materials

Lot	Package Materials: Description	Storage Temperature (°F.)	Storage Period (mo.)	Palatability Scores*: Light Meat (avg.)	Palatability Scores*: Dark Meat (avg.)
A....	0.004-in. one-dimension shrinkable polyethylene.....	0	5	8.9	8.8
			8	8.0	7.4
			11	6.9	6.2
B.....	0.002-in. unmodified polyethylene.....	0	5	8.6	8.1
			8	7.8	7.5
			11	6.7	6.0
C....	0.00035-in. aluminum foil coated with 0.0014 in. polyethylene.....	0	5	8.8	8.5
			8	8.1	7.6
			11	6.8	6.0
D.....	300 gauge (0.0009 in.) cellophane coated each side with 0.001 in. polyethylene....	0	5	8.6	8.5
			8	7.8	7.4
			11	6.7	6.2
E.....	0.0015-in. shrinkable vinyl chloride-vinylidene chloride copolymer.....	0	5	8.3	7.9
			8	7.8	7.3
			11	6.6	6.1
F.....	Experimental 0.0015-in. two-dimension shrinkable vinyl film.....	0	5	8.7	8.6
			8	8.3	8.0
			11	6.8	6.3
G....	Reference sample, in Material E overwrapped in 0.0015-in. aluminum foil.....	−15	5	9.0	9.0
		−15	8	----†	----†
		−15	11	----†	----†

	0.05		0.01	
	White Meat	Dark Meat	White Meat	Dark Meat
L.S.D. between packaging materials, 5 mo.....	0.3742	0.4501	0.4953	0.5969
L.S.D. between packaging materials, 8 mo.....	0.3804	0.5252	0.5028	0.6943

*Scoring range 1 to 10, with 10 the optimum. A score of approximately 7.0 or higher indicated a rating of good or better. Scores of the light and dark meat at the start of the experiment were 9.0 and 8.9, respectively.

†Original samples lost due to power failure. The samples were replaced for reference use only.

roasting, two birds in each oven. Each bird was cooked uncovered on a rack in an aluminum pan measuring 13x9x2½ in. An oven temperature of 325° F. (163° C.) was used and each bird was cooked to a thigh temperature of 189° to 190° F. (87° to 88° C.) as measured by a roasting thermometer. A numbered aluminum tag was inserted in each bird for code identification purposes.

Taste-Panel Evaluation

The panel of five experienced judges first agreed on an acceptable score for the reference samples, then individually scored the remaining coded samples. This technique provided each judge with a uniform basis of comparison from one judging period to another.

At each taste panel, judges sampled cuts from identical muscles. For example, from each turkey that was judged, Judge A received slice No. 1 of the breast muscle and slice No. 1 of the thigh muscle; Judge B received slice No. 2 of the breast muscle and slice No. 2 of the thigh muscle, and so on until each judge received all of the samples. The skin of the turkey was not sampled.

The maximum number of samples judged at any one time was three, in addition to the reference sample. This procedure was used

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in judging the samples for all three storage periods.

A scoring range of 1 to 10 was used, with 10 the optimum. Each judge was instructed that a score of 7 or higher should be used to indicate a rating of good or better, and that a score of 4 or lower should be used to indicate an unacceptable rating.

Analysis Of Taste-Panel Data

Four replicate samples were used for each treatment and storage period. A statistical analysis was made of the taste-panel scores to determine the significance of differences, except for the reference samples—scored individually.

RESULTS

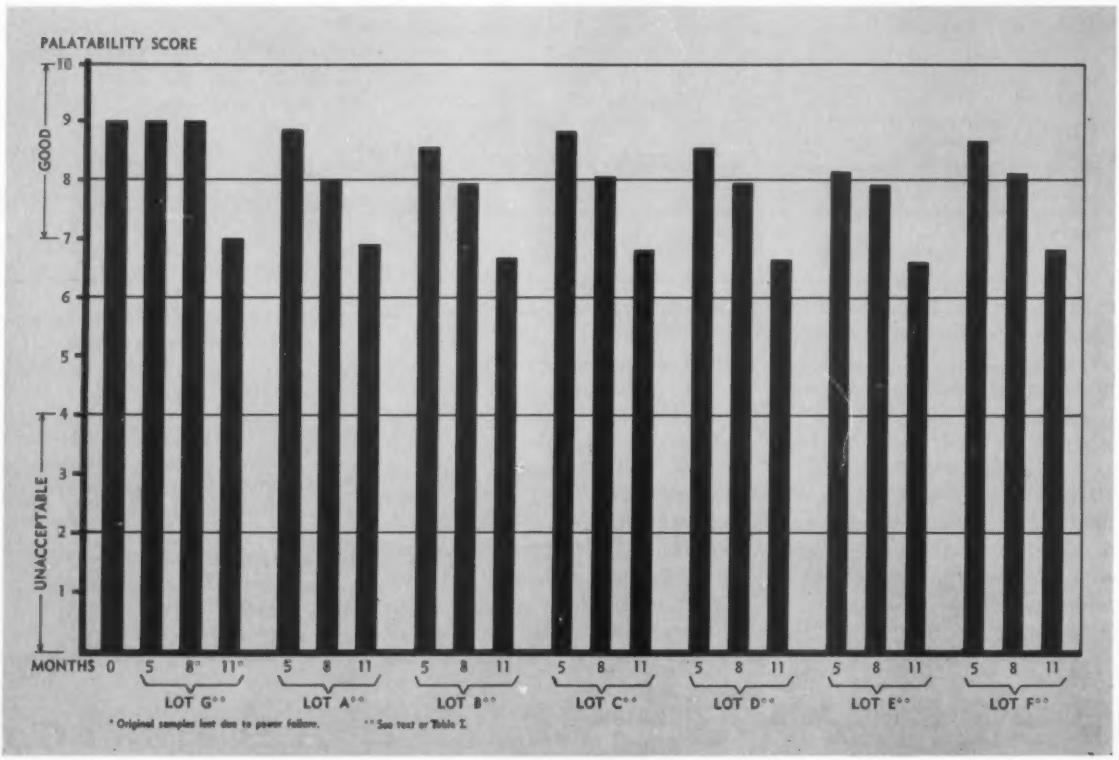
Palatability

Taste-panel scores (see graphs in Figs. 1 and 2, and Table I) indictated that there were no major differences in palatability among any of the samples stored for the same length of time. In certain instances, as noted, the differences were significant at the 1-per cent level, but these differences were not large. The only major differences were between scores for the 8- and 11-mo. storage periods.

After 5 mo., the palatability of the turkeys packaged in one-dimension shrinkable 0.004-in. polyethylene (Lot A) was significantly better, at the 1 per cent level, than that of Lot E for both light and dark meat; and better than that of Lot B for the dark meat. Similarly, the palatability of the turkeys packaged in aluminum foil coated with polyethylene (Lot C) and in two-dimension shrinkable film (Lot

Mr. Winter Retires

After 31 years at University of Minnesota, J. D. Winter has retired. During recent years he has done consulting work, including writing and keeping up-to-date a booklet on freezing foods. Mr. Winter also edits the "Orchard and Garden" column for *The Farmer* which he will continue, in addition to serving as a consultant. Over the years, Mr. Winter has contributed much of his knowledge in the form of speeches and articles to the field of packaging and freezing of foods.


PALATABILITY SCORE
GOOD
UNACCEPTABLE
10
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1
MONTHS 0 5 8* 11* 5 8 11 5 8 11 5 8 11 5 8 11 5 8 11 5 8 11
LOT G** LOT A** LOT B** LOT C** LOT D** LOT E** LOT F**
* Original samples lost due to power failure. ** See text or Table I.

1 Comparison of palatability scores maintained by frozen light turkey meat stored at 0°F. for 5, 8, and 11 mo. in 7 different packaging materials (Lots A-G).

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Max. Container Dia.	404	404	404	303	404	303	404	303	404	610	610

GRAVITY FILLERS

Model No.*	G6L	G9L	G12L	G18	G18L	G27	G27L	G36	G36L	G6Q	G9Q
Max. Capacity of Fill (oz.)	48	48	48	32	48	32	48	32	48	128	128
Max. Container Dia.	404	404	404	303	404	303	404	303	404	603	603

*Model denotes number of stations

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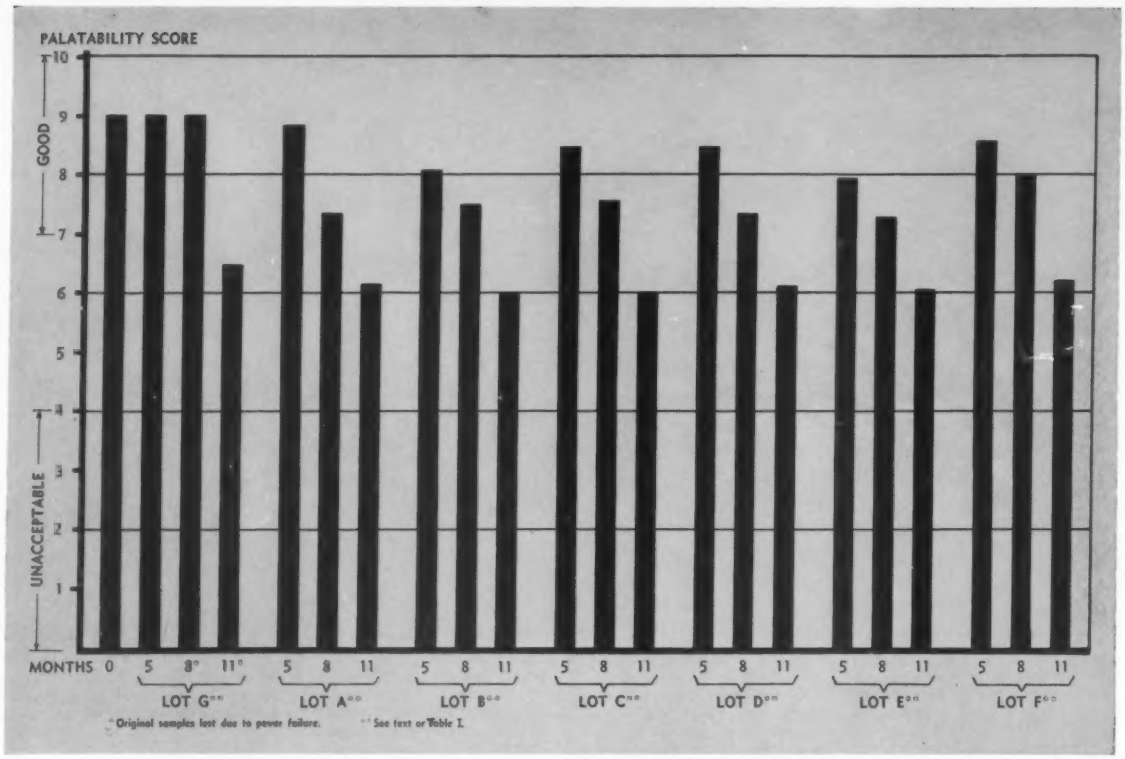

2 Comparison of palatability scores maintained by frozen dark turkey meat stored at 0°F. for 5, 8, and 11 mo. in 7 different packaging materials (Lots A-G).

F) was significantly better than that of Lot E for the dark meat. The judges were not very consistent in scoring the dark meat. The scores for all lots were high and the differences were not large.

At 8 mo., the palatability of the turkeys packaged in two-dimension shrinkable film (Lot F) was significantly better, at the 1-per cent level, than that of Lots B, D, and E for the light meat; and better than that of Lot E for the dark meat. The judges were consistent in scoring both the white and the dark meat. The scores for all lots indicated a rating of good or better and the differences were relatively small.

At 11 mo., there were no significant differences in scores among treatments, regardless of the packaging material used. The scores indicated a fairly good palatability rating, although the differences between the 8- and 11-mo. periods were large for each packaging material used.

Appearance

The color and appearance of all samples at all storage periods, both before and after thawing, were good.

TBA Values

A summary of the TBA values for samples of abdominal fat are shown in Table II. Only the average values are shown, but the original data for the replicate samples show that the results were highly variable within each lot. Furthermore, there was no apparent correlation between palatibility scores and TBA values, either for individual replicates or lot averages, for the same storage periods.

On the basis of the analyses made, only generalizations can be drawn. The samples analyzed after 11 mo. gave higher TBA values on the whole than those analyzed after 8 mo. The reference samples (Lot G) gave lower TBA values than the treatment samples, as might be expected. This corresponds to the overall results represented by the taste-panel scores.

DISCUSSION

It is evident that all of the packaging materials used in this study were very satisfactory, with respect to palatibility of the frozen product, for storage periods up to 8 mo. at 0° F. (–17.8° C.). There was a distinct and very uniform drop in palatibility scores between the 8- and 11-mo. storage periods.

Permeability Differences

The results are of interest in view of the wide differences in rate of oxygen permeability known to exist among the packaging materials used and the extent of unsaturation

of poultry fat. Chang and Watts *(1)*, in agreement with earlier studies, found poultry and pork fats to be much more unsaturated than beef or lamb fats.

Nevertheless, the results of this study are in agreement with other previously cited studies with poultry *(2, 7, 13)* when packaging materials of relatively low water-vapor permeability, but differing widely in oxygen permeability,

TABLE II

TBA Values of Abdominal Fat Of Frozen Turkey Fryer-Roasters Stored In Various Sealed Packaging Materials

Lot*	Storage Temperature (°F.)	Storage Period (mo.)	TBA Value† (avg.)
A....	0	8	0.228
		11	0.378
B....	0	8	0.290
		11	0.371
C....	0	8	0.222
		11	0.430
D....	0	8	0.272
		11	0.373
E....	0	8	0.295
		11	0.431
F....	0	8	0.266
		11	0.416
G....	—15	8	0.054
		11	0.111

*See Table I for description of packaging materials used, as indicated by the lot designation.

†Based on 4 to 5 replicates, except for Lot G at 8 mo., for which 8 replicates were used. Values are adjusted to a sample size of 1.0000 gm. of rendered fat.

were used. Where packaging materials of relatively high oxygen and water-vapor permeability were used in such studies, they were found to be inferior for the storage of frozen poultry.

All of the packaging materials included in this study were of relatively low water-vapor permeability. The results suggest that the rate of oxygen permeability of any of these films may be low enough to be satisfactory for the storage of turkeys for the length of time and the temperature used.

TBA Analyses

With respect to the results of the TBA analyses, it seems probable that the method of sampling did not truly represent the material scored by the taste panel. It is sug-

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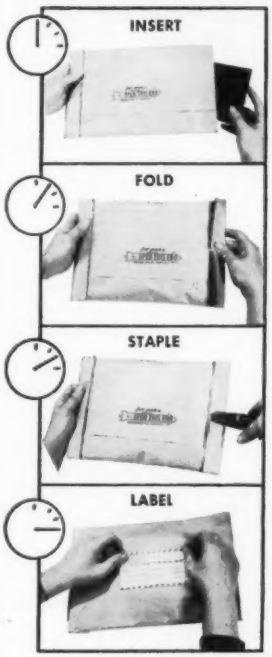

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gested that the correlation might be improved by sampling the tissue actually being tasted, or by sampling the fat drippings immediately after the bird is roasted for taste-panel use. However, Privett, Pusch, and Lundberg *(4)* found that even a high degree of fat rancidity in frozen turkeys, as judged by odor and flavors, did not represent any appreciable change in fatty acid composition of samples taken from the skin and subcutaneous fat after separation from the lean.

The work described here was conceived and undertaken prior to the passage of the Food Additives Amendment of 1958. These studies should not be interpreted as a warranty for the use of the packaging materials described. Similarly, no implications should be made regarding the use of these materials for food packaging applications under the Amendment of 1958, inasmuch as experimental evidence required under the regulations is not yet available in every instance.

Acknowledgements

The authors are indebted to Mrs. Rebecca W. Walch, Mrs. Marlys L. Anderson, and Miss Barbara Pfenning for assisting in the processing operation and in the taste-panel appraisals. Thanks are due Mr. Chun Chien and Dr. Charles E. Gates for the statistical analysis, and Mr. James Skala for chemical analysis of fat samples.

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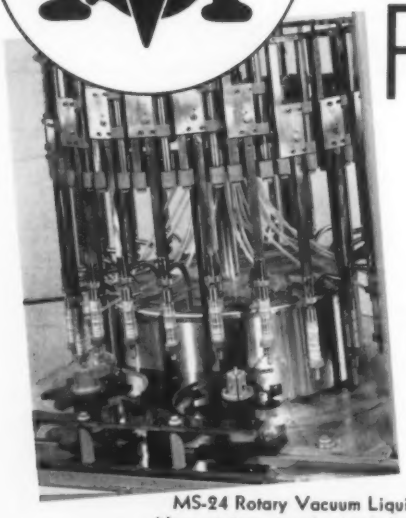

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Edward M. Krech, Jr. received a B.S. degree in mechanical engineering and an M.S. degree in business administration from Cornell University. For about 18 months of a 26-month tour of duty in the U.S. Navy, he taught thermodynamics at the U.S. Naval Academy at Annapolis. Joining Procter & Gamble a little over two years ago, Mr. Krech has spent all of his time on overseas engineering, involving packaging and processing equipment. He is a member of the American Society of Mechanical Engineers.

Pick your projects for profit — using economic evaluation

By Edward M. Krech, Jr.,
Winton Hill Technical Center,
The Procter & Gamble Company,
Cincinnati

Part I—Interpretation of profits on investment, taxes, depreciation, time value of money, working capital—as related to packaging economy.

Today's packaging specialist can no longer dismiss problems of economic evaluation as just so much accounting, or get away from them simply by immersing himself in his own technical specialty. To help him relate the seeming abstractions of economic evaluation to the realities of day-to-day packaging decisions, Mr. Krech offers an interpreted review of the subject. His views on profits on investment, taxes, depreciation, time value of money, and working capital—discussed in this first part of a two-part article—deserve study by any packaging engineer interested in applying economics to packaging.

Should I invest in that new automatic cartoner or just add a couple of men to the present line" or, "Is this chance to build a new packaging plant on the West Coast really a good deal?" are typical questions that may pop up to plague the packaging engineer. Like it or not, very few packaging engineers will go very far without eventually running into the necessity of making these types of economic decisions.

Need Good Evaluation Method

Most involve capital investment in packaging machinery, buildings, or new equipment, and all require that a choice be made between alternatives. Even where relatively minor expenditures are involved, the habit and experience of using some reasonably consistent costing and economic evaluation procedure is highly desirable.

Yet, the average packaging engineer with little business economics training has to fall back on a "seat-of-the-pants" method of making these decisions. Resulting errors mean loss of revenue, costly alterations, and the offending engineer sitting high and dry with no defense except, "Well, I thought . . ."

Packaging departments in most of the larger companies usually use some form of generally accepted economic evaluation procedure based on the overall company methods. Even these, however, are not often as comprehensive as they might be. Yet, in all cases, the packaging engineer should thoroughly understand the whys and wherefores of what he is doing.

Whether you are involved with the machine-versus-manual-labor or new-plant-justification questions mentioned, or you are a packaging machinery supplier deciding if retooling is desirable, these decisions are vital to your business. They are worthy of a good evaluation system and of your thorough understanding of the variables.

There is no real mystery involved; the difficult part is really in the estimating and forecasting routine. But, while you are interested in decisions concerning packaging problems, it is important that the factors involved be considered from an overall company viewpoint in developing a standard evaluation method. *(Turn page)*

PROFITS ON INVESTMENT

The goal of any company is to make maximum profits from each unit of investment. The profit part is obvious; that's why you're in business. But, why not profit per unit of sales or some other criteria?

We are discussing evaluation of capital expenditures which must come out of earnings that would otherwise go to the owners or stockholders. Therefore, when you buy a new cartoning machine, the owners' primary interest is in *how much profit* that investment of *their* money will produce.

On the other hand, a change in sales, either up or down, without any change in profits, has no direct effect on the owners' income or equity. Thus, it has no place as a criteria of the worth of an expenditure. This also means that maximum use must be made of the total available capital since its very existence represents an investment.

Profits Not Always Obvious

Difficulties begin when we try to relate what happens at the packaging department level to this overall company picture. Increased profits are not always directly obvious in the packaging operation. Usually, they appear as savings in direct or labor costs, decreased scrap, or some similar source. And these savings are definitely *not* directly convertible into profits on a dollar for dollar basis. Similarly, a $10,000 case packing machine does not represent that much of the company's money tied up year after year.

For our evaluation method to be valid, then, the factors affecting the value of actual profits and investment must be understood thoroughly. Only then can the savings you hope to gain, for example, by buying that new machine, be correctly converted into a dollar amount of increased profits.

TAXES

In today's economy, taxes stand right at the top of the list of factors having a strong effect on profits. Unfortunately, they cannot be ignored even when comparing two possible projects, since profits *after* taxes are not necessarily proportional to savings or profits *before* taxes.

Expense Vs. Capital Outlay

The prime example of this is the classic case of expense versus capital expenditures. Expenses are deducted from earnings *before* taxes, whereas capitalized purchases must come out of profits or surplus left *after* taxes. Thus, ignoring depreciation, at the present 52-per cent tax rate applied to most corporations, expense items have less than half the final cost of capitalized outlays. At the same time, that labor savings of $1.00 you hope to gain by buying automatic machinery, will increase the company's net profit by only $0.48.

DEPRECIATION

Although depreciation was eliminated (for simplicity) from the tax example above, it has a definite effect on profits, and must be included in any study. Depreciation is the means of permitting capitalized items, such as packaging machinery or even complete plants, to pay for themselves during the course of their productive lives.

Earnings equal to a certain percentage of the item's cost are theoretically set aside each year in a depreciation fund, supposedly to pay for the item's replacement when required. This would be primarily a bookkeeping transaction if it were not for the fact that this amount set aside each year is deducted as an expense *before* taxes and, therefore, results in a *lower tax bill* for the company.

Don't Ignore Tax Savings

Depreciation can be of particular importance when you are attempting, say, to justify automatic packaging machinery, since ignoring these tax savings could penalize the justification rather severely. A

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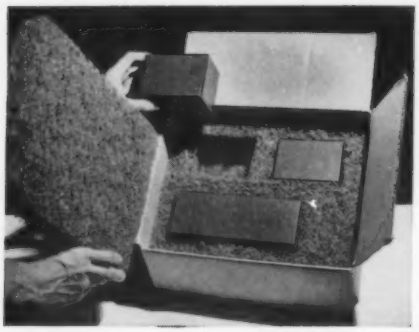

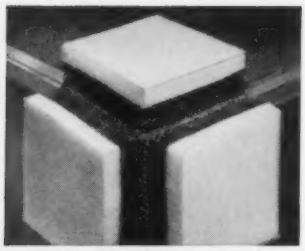

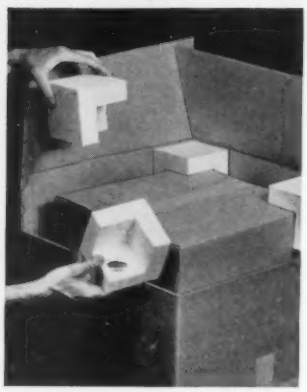

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and chances are we know a way that fits your problem best. Write for our data-packed booklet on package cushioning which explains how to select and design package cushioning to reduce damage from shock, vibration. Send request on your company letterhead. The B.F.Goodrich Company, 188 Derby Place, Shelton, Connecticut.

PACKAGE CUSHIONING BY B.F.Goodrich

quick example: That new $100,000 packaging line, depreciated using the straight-line method over a ten-year period, results in a yearly tax savings alone of $5,200.

Some companies keep two sets of books—one with the legal tax depreciation rate, and the other with the company's internal rate. The latter is usually based more on the actual life of the equipment. The legal rate should be used in any evaluation system since it is the tax effect of depreciation that influences actual cash flows.

One incidental effect of depreciation is to somewhat *reduce* the "difference in cost" between expense and capitalized outlays.

Both taxes and depreciation are items that are too often ignored when the average packaging engineer makes a rough or "hunch" choice between economic alternatives.

TIME VALUE OF MONEY

The time value of money is undoubtedly the most unrecognized, misunderstood, and sinned-against factor in most evaluation work. Yet, in all but short-duration projects, it is of utmost importance and can often be the deciding factor between acceptance and rejection. This is just as true of a packaging project as any company-wide proposal.

Your Money Can Work For You

Briefly, time value of money is the concept that money earned, or saved, in the immediate future has a greater value or worth than the same money if it is not to be earned for several years hence. The reasoning is simple. Money earned, or returned, very quickly from a project can be put to immediate use earning additional returns that would be lost if the same money were to be tied up for several years.

When rates of return on an investment run anywhere from 25 to over 100 per cent, the amounts involved become highly significant. Funds held up in ventures whose greatest returns don't come for several years can be genuinely costly to a firm.

Again, it must be carefully noted that the rates of return here are not the small ones involved in a loan or the percentage of profits over sales, but are the much higher rates expected on investment.

Yet, in spite of its obvious importance, the time value of money is more commonly ignored than heeded even by those companies with formal economic evaluation procedures. To a large extent, this is because the development of methods to handle this factor has been relatively recent and it takes time to upset the traditional systems of evaluation that have usually become firmly entrenched.

Pro's And Con's

However, we must recognize the arguments against including the time value of money in a standard procedure.

First, it makes understanding more difficult because it doesn't appear to be quite as concrete a factor as direct monetary gains or losses. Thus, unless procedures are rather carefully spelled out, the inexperienced engineer is apt to find himself hopelessly entangled in a maze of interest tables, present-worth tables, and generally jumbled numbers that would faze a C.P.A. This is to be avoided.

Second, a few quick examples show that the final rating of several alternatives will be the same with or without considering the money's time value if the cash flows of the various projects remain fairly constant year after year. Changes in cash flows, however, cause the time value of money to be highly significant. Thus, on projects, such as some machine replacements, where production, earnings, and expenses are the same each year, its inclusion will have little effect.

However, if a new product is going on the market and either a build-up in sales as the product gains acceptance, or a drop as competition moves in, can be en-

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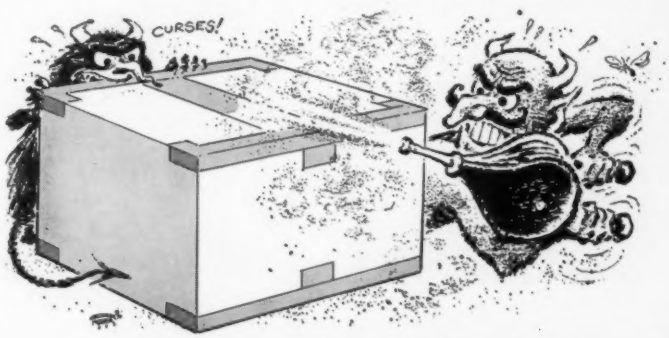

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visioned, this is when the time value of money becomes of major importance.

If a consistent measure is desired for application in all situations, it appears that an allowance for this factor is mandatory.

Salvage Value

As noted earlier, the depreciation rate that should be used in an economic evaluation is the legal allowance, since its primary effect is through resulting tax savings. This, and other causes, such as a fixed-time duration project, often result in equipment having some salvage value at the end of the time included in the evaluation. This often occurs where old automatic packaging machinery may frequently be used for many extra years.

Since this salvage, or resale, value will be forthcoming in the distant future, it could be included in the evaluation, but at a considerably reduced rate (the time value of money again). A good evaluation procedure will provide for this, and also help solve the usual problems caused by these old machines that hang around for years and years—when does the economic break-point occur at which they should be junked?

WORKING CAPITAL

Most projects will have a certain amount of so-called working capital tied up to cover salaries, contingencies, and possible irregular or cyclical expenditures. This is inactive money that could be earning a return for the company and, therefore, should be included in the evaluation of the project.

Of course, there are situations where working capital is of little significance; a decision involving a choice between two machines could be an example. Nevertheless, it is a factor that should be kept in mind and not ignored in cases where it could, or should, be applied.

Along the same line is money tied up in inventories. Many packaging supplies are not cheap. Therefore, the necessary inventory represents a sizable investment on the part of the company.

Intangibles

Now comes the usual thorn. Everyone recognizes that not everything affecting a business decision can be put into figures resulting in a positive answer. There are the intangible or unknown factors such as risk, action of competitors, consumer attitudes, and so forth, that also have a strong influence on decisions.

Just how will that new squeeze bottle package affect the market? Is the risk too great to justify automatic machinery? How great is too great? Ideally, these unknowns should be incorporated into the analysis. Actually, this is seldom done, the non-numerical items being left up to consideration by those members of management actually responsible for making the decision.

In recent years, however, the rise of scientific programming techniques, particularly the "game" theory, has enabled us to reduce many intangibles to figures. It is certainly foreseeable that these techniques will play an increasingly greater part in economic evaluation, thus relieving more of the burden from management's shoulders and reducing the part played by hunches and "feel for the business."

These then, are some of the major areas that an ideal economic evaluation procedure would cover. There are other criteria, however, concerned more with the actual usefulness of the method. As might be expected, these criteria often form the basis for the arguments that rage back and forth concerning the advantages of one procedure over another.

Calculation Time

This is undoubtedly one of the more overworked arguments for, or against, a given method. The usual complaint goes something like, "The results just don't justify

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The problem was to obtain an economical tray that was attractive and could hold all the products sold by the dairy.

A Hoerner Packaging Engineer* was called in. He worked with Rochester Dairy personnel and solved the problem by designing the corrugated tray pictured above. All the dairy's products, plus a sample of eggs were presented in the colorful Hoerner corrugated sampler tray.

DID THE IDEA WORK?

As a result of this promotion Rochester Dairy opened up 2500 new dairy food accounts! It's another example of the versatility of the Hoerner Packaging Engineer in the field of specialty design.

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the time and trouble of calculating so many variables." This reasoning must be considered running away from the facts, generally due to lack of understanding or possibly laziness.

The calculation time for the most complicated form of evaluation, even those using trial and error, is seldom more than a half-hour. This is insignificant when a project of any reasonable size is being considered. What does take time is assembling the necessary data. This runs directly into the second criteria.

Thirst For Data

Complaints usually voiced against calculation times are more likely aimed at the amount of information required to satisfy a good evaluation system. Admittedly, collecting data can be a difficult and time-consuming task, to say the least.

Yet, a truly worthwhile system has an almost unquenchable thirst for data. Why? The goal is a general procedure of economic evaluation that will be applicable in any number of situations. Thus, in one instance, one variable may be the major factor affecting the decision; in another instance, it may be a different variable, with the original one of little significance.

A general procedure must provide for all these possibilities—inherently, it must include a wide range of factors. This has the advantage of forcing the engineer to consider all possibilities. Otherwise, we might overlook a crucial point.

Get All The Facts

We must recognize that, in a modern business climate, there is a very strong interrelationship between the various elements. A small change in production may bring about major changes elsewhere in the company: in inventory, labor, profits, or many other factors. All of these things should be examined in the light of this interaction. Only in this way can major changes caused by minor shifts elsewhere be highlighted.

Although collecting and examining a large amount of information on a project may take time, it may also save considerable time and money in the long run. A little knowledge can be dangerous; the answer is to get over the hump into the realm of complete information.

Understandability

The gripe, "It's too complicated and hard to understand," is a two-way complaint. Sometimes, it is aimed at those who use the evaluation; in other words, the upper levels of management. This cannot be considered a valid objection, in my opinion. A major function of management is that of capital expenditure decisions. Thus, management should have a thorough understanding of all factors that could possibly be involved plus how they might be related, regardless of what evaluation procedure is used.

Method That Won't Vary Is Best

The objection against a complicated procedure has a little more merit when applied to those who must make the evaluation. Again, this emphasizes the importance of a standard method that will not vary from application to application.

None of the systems outlined is so complex that it won't be understood after being given a few simple applications—unless it is continuously changed for each situation. Therefore, it is possible and desirable that the engineer responsible for a project be charged with preparing its justification. At the same time, it is advisable that a specialist in economic evaluation be available to check the more complicated problems and offer advice where required.

In the second part of this two-part article, Mr. Krech explains some of the more standard evaluation methods by using them to solve a theoretical problem.

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Case history points out need for weighing all facts for a given product and package size before deciding how fast a line to install.

Don't overlook the value of medium-speed packaging

By David B. Sabine,
Assistant to the Vice President,
U. S. Vitamin & Pharmaceutical Corporation, New York

So much is said today about high-speed packaging equipment that the user can easily overlook the importance of medium-speed machines which may be more practical and economical for a given product. Mr. Sabine points out two important factors—machine change-over time and sales volume—which must be considered in deciding which equipment to install: high-speed or medium-speed. Using a case history, he explains how one company, in a step-by-step program, decided on the packaging machinery necessary to give optimum efficiency.

Labor costs were a minor factor in pharmaceutical production a generation ago. Installation of automatic equipment only meant that the working force got through its day's stint a couple of hours sooner. In an industry where production and packaging consisted of many different preparations in many different sizes, it was cheaper to keep a reserve pool of extra labor than to buy the expensive machines then available.

All this changed when World War II called for tremendous increases in production, while, at the same time, limiting available labor. Later, as inflation pushed up labor costs, automation became the watchword. Magazine articles glamorizing high-speed equipment appeared in greater numbers. The race was on to see who could produce the most units with the least labor cost.

Today's emphasis on high-speed equipment obscures the value of the medium-speed packaging line. But there are still many small companies, and small operations within large companies, where the use of comparatively slow packaging equipment is more practical and more economical than the faster machines.

Two Deciding Factors

There are at least two important considerations involved in the decision to install, or not to install, expensive, high-speed automated equipment:

(1) The first and major consideration is *sales volume*. Any production set-up that produces inventories greatly in excess of sales is uneconomical. Idle equipment is a large and generous contributor to overhead, that bugaboo of production men and accountants alike.

(2) Another factor which looms large in the use of automatic equipment is *change-over time*. It is obvious that a set-up is uneconomical when the clean-up and change-over time equals or exceeds the running time required for that particular item and/or size.

Yet this factor is often overlooked when clean-up and change-over are a bit less than the required running time or when the changes are made in overtime periods. Further, the complexity of the equipment is another consideration. Some of the machines available today do a superb job, but require the full-time services of a mechanical wizard.

All the facts involved must be carefully weighed for each product and size. The fundamental questions are the same, but, since it is an individual decision, no two

companies are likely to come up with quite the same answer.

Modernizing A Line

All these things figured in our thinking when we decided, some years ago, to revamp our production line at Arlington. The existing production line consisted of an incredibly old-fashioned bottle washer, a hand-operated filling machine, a hand-operated capper, and a semi-automatic labeler. At the end of the conveyor belt, a man packed the shipping containers, sealed them (using a paint brush and a pot of glue), and stacked them on the floor to dry before loading them on the chute to the stock room on the floor below.

The minimum number of workers on this line was five women and two men. Even at that, it was an improvement over the time when I first saw it 35 years ago when corks were used instead of molded caps, and the bottles were packed in wooden boxes which had to be nailed closed.

Our first step in revamping was to determine the desired level of production. The maximum production was then about 3,600 units each 8-hr. day. Study of past sales, then projected into the future, indicated that 6,000 units/day would be ample for the foreseeable life of any new equipment to be purchased. We added a safety factor of 50 per cent, and planned the line for 6,000 units/day with the flexibility which would permit a production maximum of 9,000 units, should we ever require it.

Build Line Around Labeler

It was obvious that the only piece of equipment then on hand that could meet this production requirement was our Economic labeler. Even an inexperienced operator had no trouble labeling 12 bottles/min. on this machine, as presently geared, and this could be stepped up to 20/min. by a change in gear ratio, without exceeding the operator's physical capacity to handle them. Since this

HOBBS 44" "Versawind"

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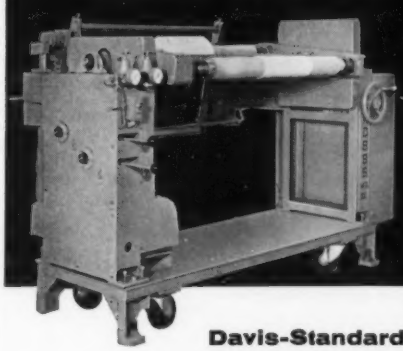

Hobbs does give you more for your winding money and here is proof positive!

The 44" Hobbs Versawind shown here is joined to a Thermatic Extruder, Die and Blown Film Tower manufactured by Davis-Standard, a division of Franklin Research Corporation of Mystic, Connecticut. Operating on a 5-day a week basis, the unit tests batches of thermoplastics sent in by extruder customers and runs pilot extruder tests.

Davis-Standard reports

"We selected this Hobbs winder because, in addition to the greater output that it permits, we get more control and range, which are essential for our testing purposes. Every batch of material we run requires a slightly different set-up and the Hobbs Versawind adapts quickly to whatever the tolerance requirement may be."

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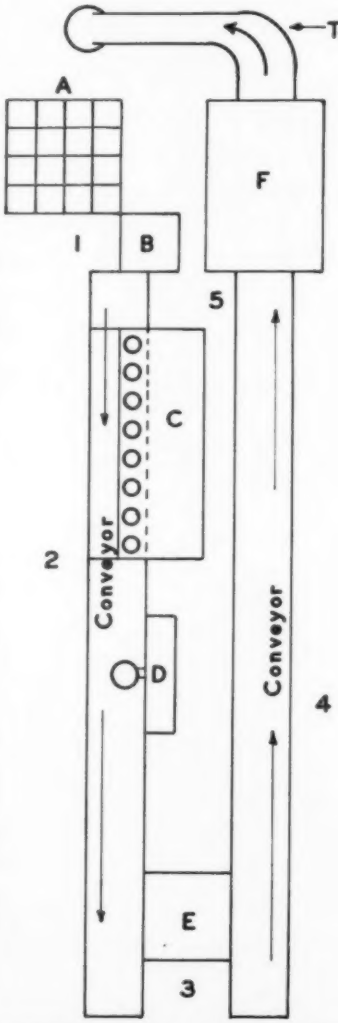
allowed for even the safety factor, we kept this labeler and designed the rest of the line around it.

We knew before we started that the first thing to go was the monstrous bottle washer. Occupying nearly 250 sq. ft., it was a relic of the days when bottles arrived in wooden cases and were really dirty. So, we knew we needed an air cleaner, a filler, a capper, and some type of packer or case sealer.

Choosing New Equipment

Our first step was to study the advertising pages of the technical and trade journals. From these, we selected models of each type of machine from several manufacturers. Study of additional literature and discussions with the manufacturers' representatives eliminated some of the models.

Our location in the metropolitan area simplified the next step; manufacturers using equipment we were considering let us visit their plants to observe in action all the equipment we had not previously eliminated. By extrapolating to our needs the performance of each machine as we saw it in operation, we



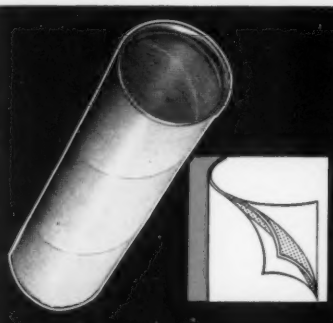
Machines:

A – Stack of bottles in reshippers
B – Air cleaner
C – Straight-line filler
D – Semi-automatic capper
E – Labeler
F – Automatic case sealer

Operators:

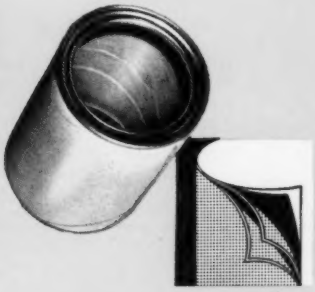
1 – Blows bottles and sets them on conveyor
2 – Watches filler and sets caps on bottles
3 – Labels bottles
4 – Affixes cellulose seals
5 – Packs bottles in reshippers and starts them through case sealer

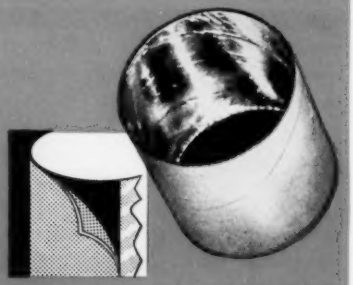
U-SHAPED LAYOUT was result of modernizing packaging line. After thorough study of various machine change-over times and sales volume, machinery for optimum efficiency was chosen —not only on performance basis, but also on operation simplicity, and low maintenance needs.



LARDPAK* LINER.
Lardpak liner inside, then fibre, and printed Lardpak paper used outside. A grease barrier for scores of materials. Example of use: caulking compounds.

LARDPAK,* PITCH-BACKED.
This combination offers the packer both grease and moisture resistance. Example of use: various chemicals.





FOIL LINER.
Foil backed by pitch followed by two layers of fibre laminated with glue. Pitch serves two purposes: As adhesive for foil (2) sealer for pin holes in foil. Example of use: seed inoculents.

• There are many sides

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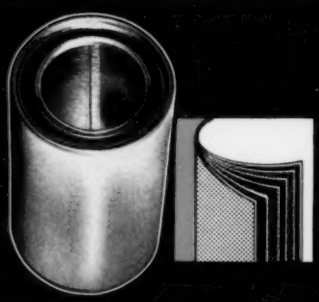
• a complete line to fit your packaging needs

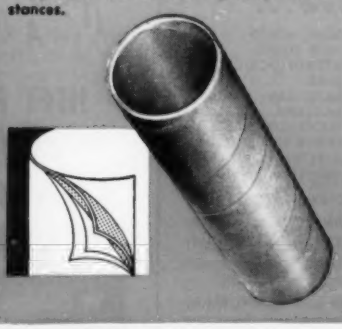


CHIP KB.
Pitch layers between layers of fibre, for moisture resistance. Convolute can shown here. Example of use: wallpaper cleaner, cold water paints.

Have You a Fibre Can Packaging Problem?
Contact your nearest R. C. Sales Office for experienced advice. There's no obligation.

PARAFFIN COATING.
Parrafin lining obtained two ways: spiral wound from coated fibre, or sprayed in convolute can. Example of use: moth crystals, drugs, etc.

LAMINATED KLEERWRAP.*
Lardpak liner inside, followed by fibre, followed by two pieces of glassine laminated together with wax. High grease and moisture resistance. Example of use: caulking compounds and similar "greasy" substances.



FOIL PAPER-BACKED.
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were able to select equipment that, when set up in our line, performed exactly as predicted from the first day of operation.

The equipment finally selected consisted of a dual-spout, semi-automatic air cleaner, an Elgin 8-spout, straight-line filler, an Elgin semi-automatic capper, and a Ferguson case sealer. We chose these particular machines, not only on the basis of performance, but also on simplicity of operation, ease of change-over and cleaning, and low maintenance requirements.

Workers "Took To" Line

We were particularly fortunate in other ways. Although our workers could be classed as unskilled, most of them had been with us for many years so that we knew them and their capacities, and they knew us and our requirements.

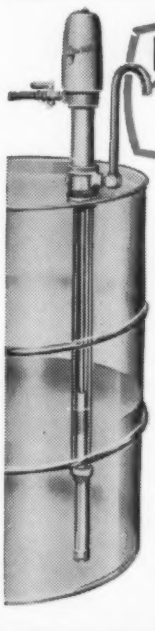
There was no difficulty over the displacement of workers. The man who wielded the glue pot had already decided to go to college on his GI bill, but agreed to stay on until the new equipment was installed. Similarly, one of the women workers postponed her retirement. The others all welcomed the new equipment because all the jobs were made easier.

Morale was high and they were proud of the new, more efficient line. There was no difficulty in training new workers when it became necessary, because of the simplicity of each operation. The man who had previously operated the hand-filling machine (a job occupying his full attention) was now released to keep his eye on the whole line and see that it was running properly. He could not be classed an an expert mechanic, but he was intelligent and handy with tools, thus qualifying him for maintenance as well as change-over.

Ease Of Change-Over

Change-over and clean-up were big considerations in our final choice. With the machines finally chosen, bottle size and change-over required only slight adjustments to

David B. Sabine was graduated from Tufts University with a B.S. degree in chemistry. He has also taken some management courses at Columbia University. Shortly after joining Arlington Chemical Co. in 1925 as a control chemist, he became chief analytical chemist and retained that position until 1937 when he was placed in charge of manufacturing, production and packaging. In 1942 he became plant manager. After U. S. Vitamin & Pharmaceutical Corp. purchased Arlington, he became assistant to the vice president, chiefly concerned with research and development and acting in an advisory capacity for the manufacturing and packaging departments. Mr. Sabine is a member of American Chemical Society, The Metropolitan Microchemical Society, Institute of Food Technologists, The Society of American Bacteriologists, and Sigma Xi. He is also included in *Who's Who in Chemistry, Who's Who in the East* and *American Men of Science.*



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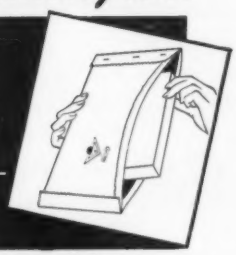

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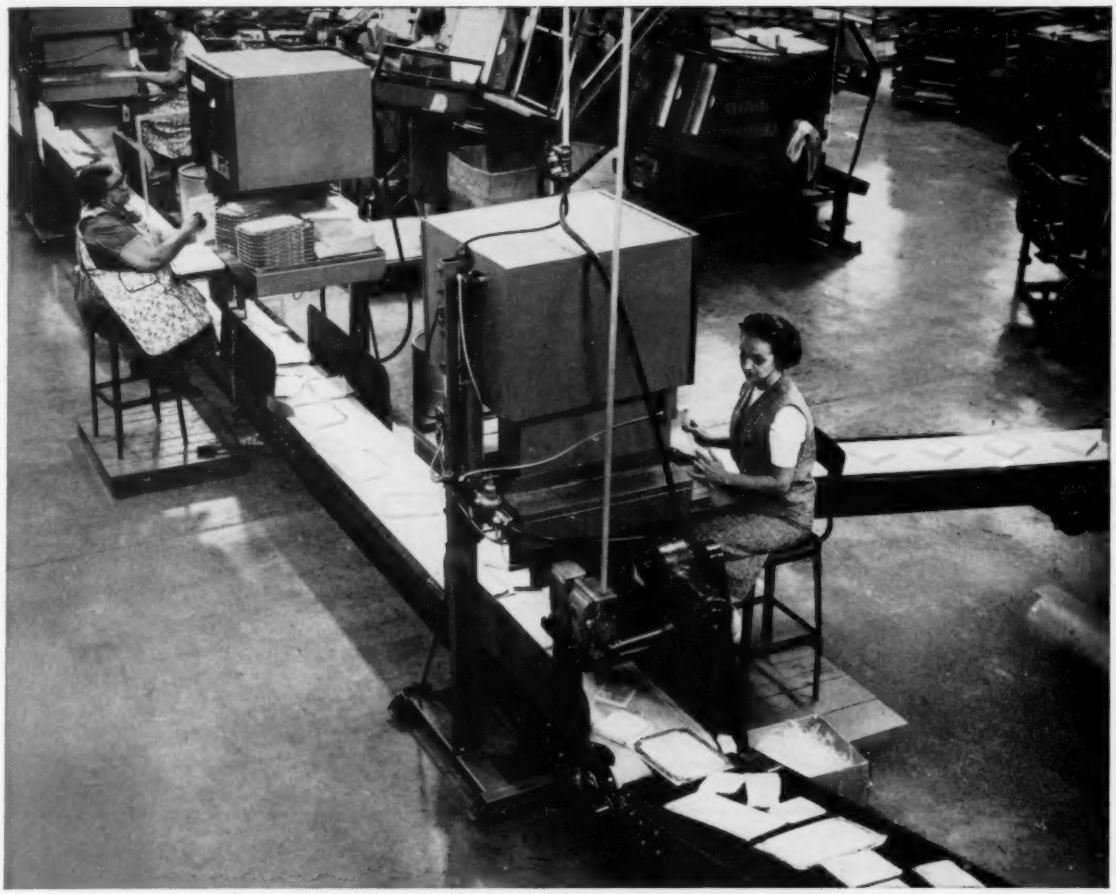

HOW TO EASE POLYETHYLENE FILM INTO YOUR OVERWRAP PACKAGING OPERATIONS

You can lower your costs and end up with better overwraps by switching your packaging operations to economical polyethylene film. The period of change-over to polyethylene will be smooth, too, if you keep these three simple rules in mind:

OBTAIN THE PROPER EQUIPMENT

Various types of polyethylene-handling equipment and accessories are available from packaging machinery manufacturers and film suppliers. The different heat-sealing and temperature control systems, in particular, should be thoroughly investigated, since these are generally the most critical features of equipment or adapters. And take advantage of the help you can receive from U.S.I. packaging and instrument and control engineers in selecting the equipment you need. Because our experts work closely with machinery makers, they are able to answer your questions and help you solve problems.

MAINTAIN SPECIFIED FILM GAUGE

For proper sealing, the thickness of the film must be uniform because this affects heat transfer. The way to guarantee uniform thickness is to set up realistic film gauge variation specifications for your packaging operation. Then make sure your supplier meets these specs.

In general the best type of film to use in overwrap applications is *cast* polyethylene film. It has a more positive gauge control during manufacture, and it has exceptional clarity—an important advantage in most overwrap packaging. U.S.I. supplies PETROTHENE® polyethylene resins which are ideal for making *cast* film.

TRAIN OPERATING PERSONNEL

Any initial change-over problems can be greatly eased by proper training and supervision of operators. Many machinery manufacturers and film suppliers will show operators how to get best performance from both machinery and film. U.S.I., too, will be glad to advise on any technical or training problems that may arise.

Wherever these three points have been followed, polyethylene film has delivered its full promise—a more economical, more saleable package for baked goods, paper, candy, and many other products. If you'd like the advice or aid of U.S.I. in making the most of polyethylene in overwrap machinery, write to:

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filler, capper, labeler, and case sealer, for a total of 20 to 30 min., except for the small sample bottles when the spouts on the filling machine had to be changed, increasing the time by 25 to 30 min. Clean-up involved only washing out the filling machine reservoir, wiping off the applicators, and removing the glue pots from the labeler and case sealer—a task of 30 to 45 min.

Switch To Reshippers

With the new equipment on order, we took another step which was very important in the over-all efficiency of our packaging and shipping departments. It had been our practice to receive all of our bottles in service shippers and to purchase knock-down, imprinted shippers for shipping finished goods. Setting up these knock-down shippers had been a so-called "spare time" activity of the men in the shipping room.

This arrangement was nothing but a big headache for the plant manager as well as the production manager. Since the supply of shipping cases relied on "spare time" activity, it seemed that on only the "rarest day in June" was there enough of the right kind of boxes at the right time.

We asked our bottle supplier to ship bottles to us in imprinted reshippers. This involved a slight extra cost which our accountants discovered was less than the cost of the "spare time" work of the shipping department.

Benefits Of U-Line

With this settled, we set up our production unit in a U-shape rather than a straight line (see illustration). This design has a number of advantages, one of which is "interior lines" like an army on the defense. The distance between any two points is shorter than a unit set upon a straight line.

Also, by receiving the bottles in reshippers, we eliminated one materials handling operation. Materials handling, another very generous contributor to overhead, is particularly dangerous because of its obscure nature.

As the floor plan shows, bottles in reshippers were delivered to the air cleaner. They were cleaned, set on the conveyor belt, filled, and capped. The labeling operation transferred the bottles to the other leg of the U-shaped line. They then traveled back to the point of origin, were repacked in the original containers, and sent through the automatic case sealer which discharged the cases directly onto the chute, down to the stockroom.

Everyone was happy with the new set up. Even taking into account "coffee breaks," set-up, and clean-up times, production was increased 25 per cent without "snapping any whips," and so the production manager was happy. The workers liked the new machines and felt that their work was easier —so they were happy. And, top management was delighted because wage savings alone covered the total cost of the equipment in a bit less than 14 months. *(End)*

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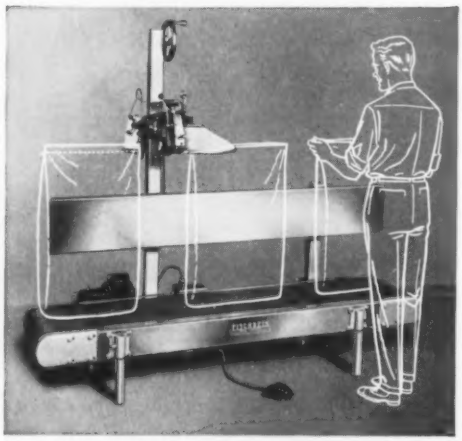

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Part II—Bottom folding process in bag machines; bag and closure folding in automatic packaging machines

Packaging machines cause mechanical stresses in flexible materials

By H.-E. Roder,
Farbwerke Hoechst A. G.,
Frankfurt, Germany,

Rudolf Heiss and G. Schricker,
Institute for Food Technology & Packaging,
Munich, Germany

In this second part of a three-part article on mechanical stresses in flexible packaging materials, the authors continue discussing bag machines—various stresses that bottom folding imposes on flexible packaging materials, keeping stresses at a minimum when the tube is spread out, bottom creases and the formation of pinholes, among other points. Going into the subject of automatic packaging machines, they explain what happens when the bag is being formed, pointing out the necessity of proper machine design, and telling what the "pliability factor" of a material is—including the equation for calculating this factor. Also included are the individual steps in forming a "harmonica closure" which consists of four *very different* creasing processes. In next month's issue, the authors conclude with discussions on wrapping machines—for small pieces—and form-fill-and-seal bag machines.

IN the first part of this article, we described the tube-forming process found in bag machines, and explained how tensile stresses occur in the web of the packaging material while under tension; also, that uniform stressing can be achieved. We discussed simple and multiple creases, and the effects thereon of machine speed, creasing time, and rate of creasing. Now we are ready to look at the complex structure of creases which occur in the bottom fold of a bag.

1C. BOTTOM FOLDING

After the tube and its longitudinal and transverse creases are formed, the tube, in a pressed flat condition, is led onto a rotating drum about 1 m. (39.3 in.) in diameter, on which the bag bottom is folded. The individual stages are shown in Fig. 3.*

In Stage a, the bag surface ABB′A′A adjacent to the drum is first held firmly by means of a suction cup, 1, which grasps the bag in the middle of the surface between the transverse crease Q_2 and the edge AB. At the same time, the second suction cup, 2, holds the opposite surface between Q_2 and ED in such a way that the star-shaped cross-section shown in Fig. 3a is formed.

At this point, the longitudinal creases A, B, D, and E are gripped by four knife-like clips, 3 (see Fig. 3b), at a position several millimeters behind the transverse crease Q_2. The two upper clips hold the upper surface ABB′A′A of the bag firmly on to the drum while the lower clips move downward, perpendicular to the lower surface EDD′E′E of the tube, and convert the star-shaped section ABCD EFA into a rectangular section ABDEA.

While the edge AB (see Fig. 3b) of the upper tube surface is held

*(Editor's note: Figs. 2, 3, 9a, 9b and 10, which appeared in Part I, are reprinted here for the reader's convenience.)

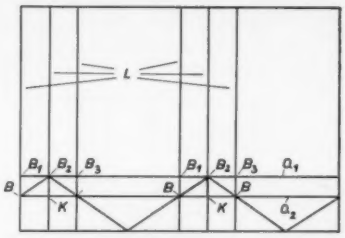
by a flat steel tongue, 4, applied at its mid-point, a second curved steel tongue, 4, presses down the center of the edge ED and changes the rectangular section into the six-cornered shape shown in Fig. 3c. During this spreading of the section, the side flaps fold inward about the transverse crease Q_2 as the axes of rotation (see Figs. 3c-d), this being further assisted by a pair of steel tongues. The top and bottom flaps are finally folded inward about the two coinciding creases L and Q_2 (Q_2; L in Fig. 3d) as axes, after which the bag leaves the machine. Fig. 3e shows finished bag.

Imposes Various Stresses

Various types of stresses are imposed by the bottom folding. In order to withstand the splaying by means of the clips, the packaging material must possess adequate tensile strength and resistance to tearing. Between the clips, transmitting the tension to the packaging material, lie the longitudinal creases which reduce to a greater, or lesser, degree the material strength.

Although demands are placed upon the tensile strength and tearing resistance of the material during splaying, it would be incorrect, for the following reasons, to conclude from this fact that the packaging material must necessarily possess good mechanical properties in order to withstand this loading:

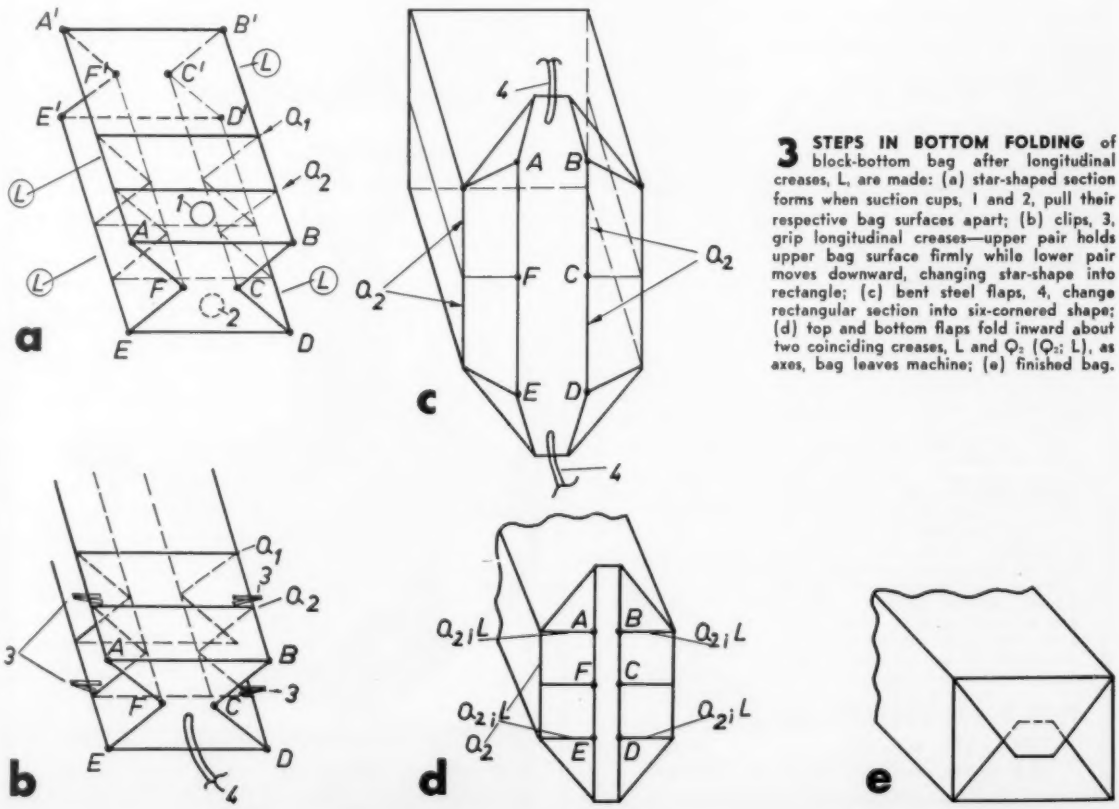
Tensile and tearing strengths are reduced by the crease. Absolute measure of the weakening is certainly dependent on the material strength. The reason for the weakening, however, is in the elongation-to-rupture of the material, as was pointed out in the discussion of the creasing processes *(3)*. It is therefore better not to place special emphasis on the physical strength of the packaging material (it is required also to be able to process material of relatively low physical strength), but to insure that the elongation-to-rupture of the material is as large as possible, so that the reduction in strength, due to the presence of the crease, is as small as possible.



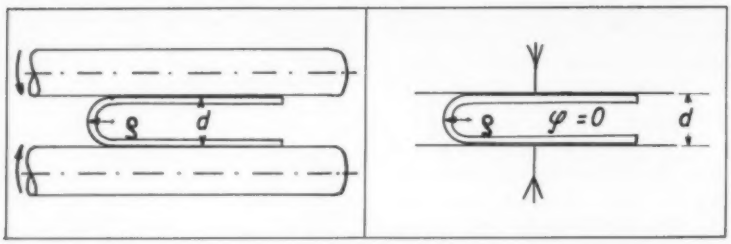
2 ARRANGEMENTS OF CREASES in block-bottom bag: L for longitudinal, Q_1 and Q_2 for transverse, B for bag creases, and K for diagonals. All can be reproduced on crease testing apparatus shown in Fig. 10.

Shoot For Optimum Strength

It is a common misunderstanding that a packaging material must be



3 STEPS IN BOTTOM FOLDING of block-bottom bag after longitudinal creases, L, are made: (a) star-shaped section forms when suction cups, 1 and 2, pull their respective bag surfaces apart; (b) clips, 3, grip longitudinal creases—upper pair holds upper bag surface firmly while lower pair moves downward, changing star-shape into rectangle; (c) bent steel flaps, 4, change rectangular section into six-cornered shape; (d) top and bottom flaps fold inward about two coinciding creases, L and Q_2 (Q_2; L), as axes, bag leaves machine; (e) finished bag.



9a **LONGITUDINAL CREASE** which is permanent bending of packaging material through radius of curvature, ρ, is made on bag machine by means of rolls bearing on one another. Distance between rollers is d.

9b **MACHINE-TYPE CREASES** are produced on testing apparatus. ρ is radius of curvature, d is distance between cheeks, φ represents "spring-back" angle which, while material is between cheeks, is equal to 0.

of the greatest possible strength to obtain, after processing, the strongest possible bag. This will be illustrated by means of the following example:

If samples of cellulose acetate film 250μ thick are climatized, one at 20°C. and 30 per cent R.H., and the other at 30°C. and 90 per cent R.H., a tensile test will show that the tensile strength of the latter sample is only 70 per cent of that of the former. If, however, both samples are now creased with a gap setting of the cheeks of 500μ, the sample climatized under the less humid conditions will break, due to its low elongation at rupture, while the sample at high relative humidity will not break since its elongation-to-rupture is greater. If the strengths are measured after creasing, the former sample, which initially possessed the greater strength, now has zero strength (rupture), while the strength of the second sample has been only slightly affected by creasing.

The example chosen represents an extreme case, since, in one sample, rupture occurred. But analogous relationships hold for papers and films for which a complete rupture never occurs.

Put Stresses At Minimum

In order to compensate for inadequate quality of the packaging material, it is possible to adjust the elements which splay the tube, so that the packaging material is subjected to the minimum possible stress. The packaging material processor is frequently called upon to decide whether or not it should raise the quality of the material in order to dispense with the necessity for very fine machine adjustment, thus saving time and trouble. If this procedure is adopted, however, a study of all forms of stressing will show that a long list of "essential" properties, which must be possessed by the packaging material, can be drawn up.

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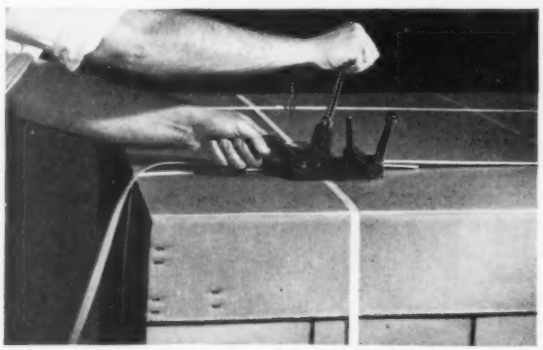

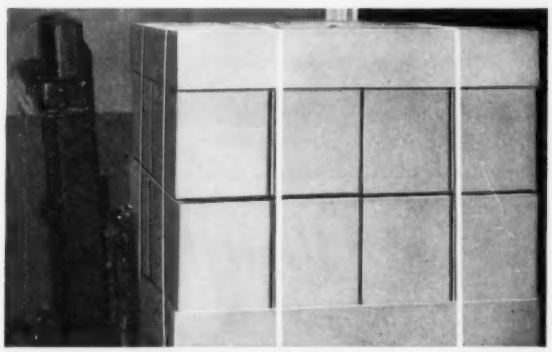

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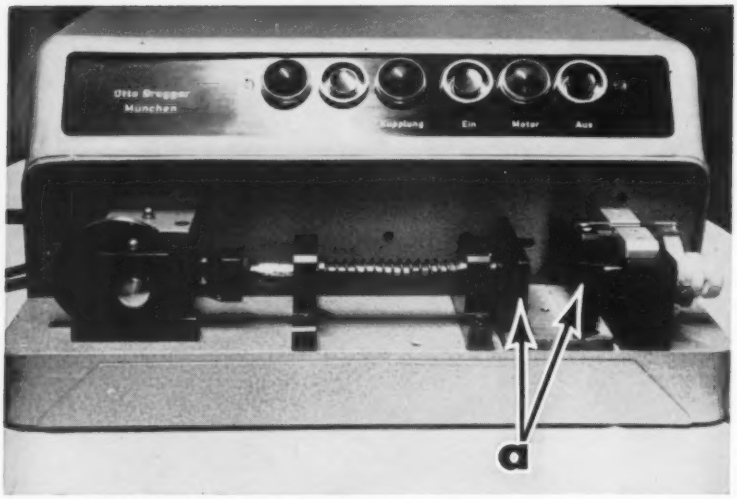

10 **DYNAMIC CREASING APPARATUS** reproduces creases made on bag machine. It consists of two cheeks, a, guided parallel to one another. One moves forward and backward at constant velocity; other is adjustable, assuring definite radius of curvature of material.

special emphasis on certain properties, other properties detrimental to the processing must probably be tolerated. For example, by definition, a material of high tensile strength possesses a high flexural stiffness, which can lead to various difficulties in processing (see section on "Pinhole Formation In Bending"). Therefore, in this work, we will single out a few properties of the packaging material important for satisfactory processing.

Intersecting Creases

A further type of stressing in the bottom folding is due to the intersection of various creases. Note in Fig. 2 that there are many different types of intersections formed under various conditions. It is possible to reproduce each individual intersection of several pieces in the crease testing apparatus (Fig. 10) by carrying through the individual stages in folding.

The effect of the radius of curvature (machine setting) in lowering the resilience and weakening the material also can exactly be reproduced in the crease testing apparatus. This can be demonstrated using the intersections marked B_1 and B_2 in Fig. 2 as an example.

A packaging material sample 10x10 cm. ($\sim$4x4 in.) is laid in the form of a U in the crease testing apparatus, so that the crease to be formed runs in the longitudi-

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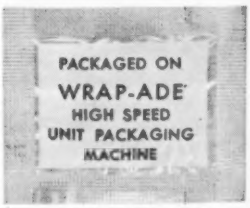

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Model UPH

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11 **PORE FORMATION** in packaging material of high flexural stiffness results when material is deformed in two directions—at intersection, say, of two creases. Test sample is aluminum foil. A denotes polygons pushed into one another, B shows polygon corners at which pin-holes can develop.

nal direction of the material. The gap, d, of the creasing jaws is set to double the thickness δ of the material ($d = 2\ \delta$). After creasing at a rate corresponding to that used in practice, this sample is now creased at right angles to the previous direction without having been previously unfolded. For this creasing, the gap is set to $d = 4\ \delta$, since there are now four layers of material in the fold. The sample is now unfolded and tested for gas or vapor permeability, or tensile strength.

In order to determine the influence of the machine setting, the gap can be increased. In a similar manner all the crease intersections shown in Fig. 2 can be reproduced.

Pinhole Formation In Bending

If a finished block-bottom bag is folded out flat, various small pores, holes, or tears are visible to the naked eye at the intersections of the creases. There are various reasons for pore formation.

At the intersection of creases, the material is extended and compressed in two directions. In many cases, the material will withstand the deformation in one direction, namely, when it possesses an elongation-to-rupture higher than the maximum elongation in that direction under the conditions of creasing (moisture content, rate of creasing). The material is now already in a weakened condition. If it is deformed in another direction by a further crease (perpendicular to the first, say), it will tear at the point of intersection if it does not possess a sufficiently high elongation.

On this effect, a second effect is superimposed, which depends on the flexural rigidity and inhomogeneity of the material. This type of pinhole formation will be illustrated with the following experiment:

If a polyethylene web of any thickness, with length L and breadth b, is clamped between two jaws which are parallel to one another and horizontally positioned (their distance apart is L initially), the web will deflect downwards a certain amount due to its own weight. Its neutral axis describes a so-called elastic line. The amount of the maximum deflection depends on the weight and stiffness of the material.

If the distance L between the jaws is shortened by a given amount, all the lines parallel to the edge of the web become arranged into a curve, similar in shape to the Gaussian distribution curve. Its precise form is unimportant for the purposes of this study.

If we now clamp a 10 to 20-μ thick aluminum foil between the jaws at the same distance apart, L (see Fig. 11), the foil will also deflect, but by a smaller amount due to its lower weight per unit area. If we now slowly reduce the distance between the clamps, the foil no longer behaves in a manner similar to the polyethylene; on the contrary, a number of almost flat, polygon-shaped surfaces are formed (see Fig. 11)—the foil crumples. If the distance between the jaws is reduced further, the polygons are pushed into one another.

The corners and edges of the polygons can, according to the type of material, be relatively hard and sharp, so that the foil cuts or tears

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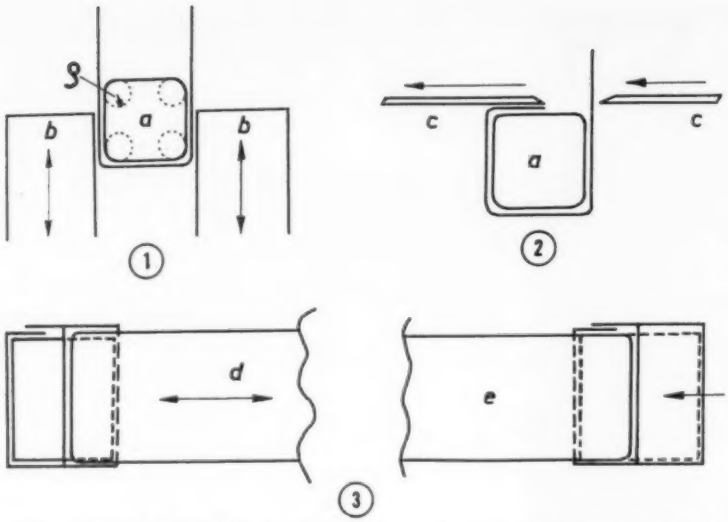
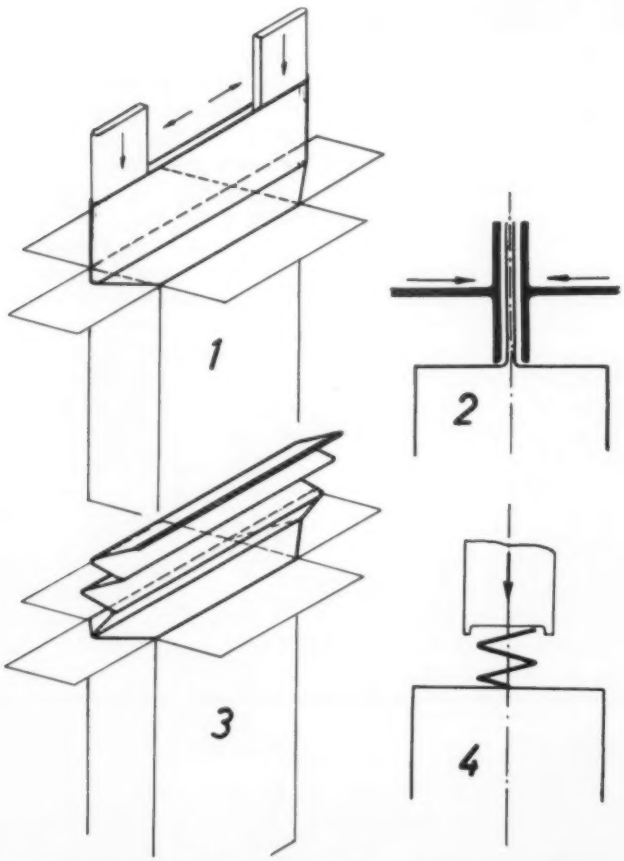


12 **FOLDING INNER BAG** around mandrel, a, on automatic packaging machine, sliders, b, move upward over mandrel's side surfaces (Step 1). Sliders, c, fold surfaces protruding above mandrel around upper corners (Step 2). Sliders, d and e, successively fold inward two opposite surfaces protruding from top of mandrel (Step 3). Then two flaps perpendicular to these are folded inward. To shape properly around mandrel, material must have a minimum stiffness.



13a **HARMONICA CLOSURE** consists of four very different creasing processes: 1—spreading open bag; 2—pressing outspread bag flat; 3—harmonica-folding in two or three folds; 4—preventing folded harmonica from springing open—held down by plate.

itself at these points. The necessary force or energy for the tearing must be transmitted from the jaws by the packaging material. The greater the stiffness of the polygons and therefore of the packaging material, the more likely this is to occur.

Polygon formation is, however, only possible, even in the case of stiff packaging materials, when there is inhomogeneity present in the material. This is the case in most materials. Reduced stiffness at these points of weakness leads to the polygon formation. The lower the elongation-to-rupture of the material, the more easily tearing and pinhole formation will occur. For this reason, they may be very much reduced in packaging materials possessing low elongation, by coating the materials with a tight film of high extensibility.

CONCLUSION: STRESSES FROM BAG MACHINES

From the investigations of stresses imposed during tube forming, creasing, and bottom folding, we may conclude that a packaging material can only be satisfactorily run on a bag machine, with minimum deterioration in its vapor barrier properties and strength, when it possesses mechanical properties substantially corresponding to those important for creasing.

These properties are: low yield point ϵ_{Fl}, small resilience (elastic spring-back) ϵ_{el}, sufficiently high elongation-to-rupture ϵ_{Br}, in a direction vertical to the crease line, and a moderate flexural rigidity in the elastic and elastic-plastic ranges. Inadequate stiffness makes guiding the material through the machine difficult; excessive stiffness leads to formation of tears by deforming those packaging materials having relatively low elongation-to-rupture.

Permissible Values

The permissible value of the quantities ϵ_{el} and ϵ_{Fl} must be decided in the individual cases by making an $lg2\rho$-ϕ-diagram *(3)*. All data on mechanical quantities

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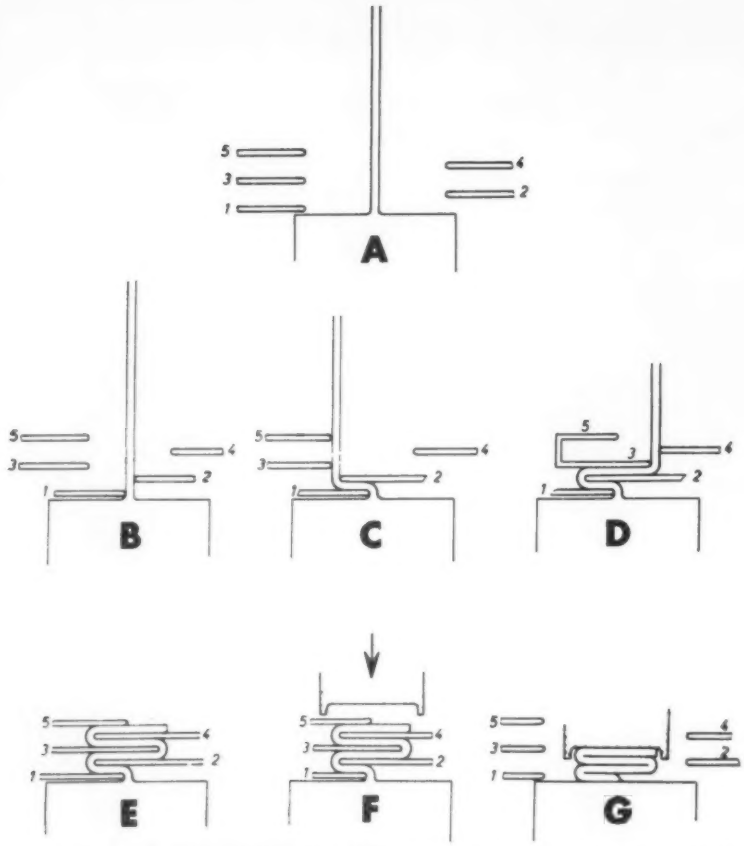

13b **SLIDERS FORM ACTUAL HARMONICA** (Stage 3, Fig. 13a). Curvature of packaging material in each crease is determined by thickness of respective slider. Steps A through G show successive actions of sliders 1 through 5. Plate (arrow) compresses folds.

should be obtained under the given processing conditions (moisture, time, and conversion rate).

The condition that ϵ_{Fl}, should be as small as possible is in conflict with the fact that, for tube forming, the greatest possible ϵ_{Fl} is desirable to avoid permanent elongation. In spite of this fact, in order to be able to maintain a small value of ϵ_{Fl}, we suggest a design which enables a uniform stress distribution in the web to be attained in the tube forming. This insures that no stress concentration occurs in the web. Thus, ϵ_{Fl} can be limited to 1 to 2 per cent, except when using extremely stiff materials.

Have Low Spring-Back

Setting of the creasing rolls (gap d or radius of curvature ρ in Fig. 9a) must be carried out according to the $lg2\rho$-ϕ-diagram so that a small spring-back angle ϕ is attained. If the packaging material is thereby weakened to such an extent that the required protective qualities can no longer be guaranteed, then a film-coated packaging material should be used.

Use of coated materials is particularly recommended when working at high machine speeds which often result in an increase in the resilience and a decrease in the elongation-to-rupture. Packaging materials which are covered with a layer of plastic (e.g., polyethylene) are particularly suitable in this case, since their elongation-to-rupture seldom becomes less than 100 per cent even at the highest machine speeds used.

With careful machine setting, materials of relatively low tearing strength can also be used. The requirement for highest possible elongation-to-rupture provides an additional assurance since tears are reduced to a minimum.

Choose Materials Carefully

In a statistical study, Corte *(1)* showed that the greater the elongation-to-rupture of the unprocessed packaging material in the transverse direction, the better are the mechanical properties of paper bags. This result is contained in our requirement for greatest possible elongation-to-rupture in two mutually perpendicular directions.

In Corte's work, the correlation found between the resistance to damage in dropping of paper bags and the internal tearing strength of the unprocessed material, should not lead to the packaging material being selected solely according to the latter characteristic, since this correlation does not appear true for all materials. For example, according to this method of selection, packaging materials which possess a high initial tearing strength, but very small internal tearing strength, would never be used. A packaging material which, because of its high initial tearing strength, does not tear, cannot be stressed under conditions of propagation of the tear. Thus, in such cases, this property need not be taken into account.

2. AUTOMATIC PACKAGING MACHINES

The operations involving stresses in a packaging material by automatic packaging machines, are best explained by using a machine on which the flexible package is folded around a mandrel. This type machine consists essentially of three turntables: (1) for manufacturing the bag and enclosing it in the outer carton, (2) for filling, and (3) for sealing of the bag and carton. Motion is transmitted to these operations through a Geneva cross. The individual elements which carry out the operations on the packaging material are driven by cams.

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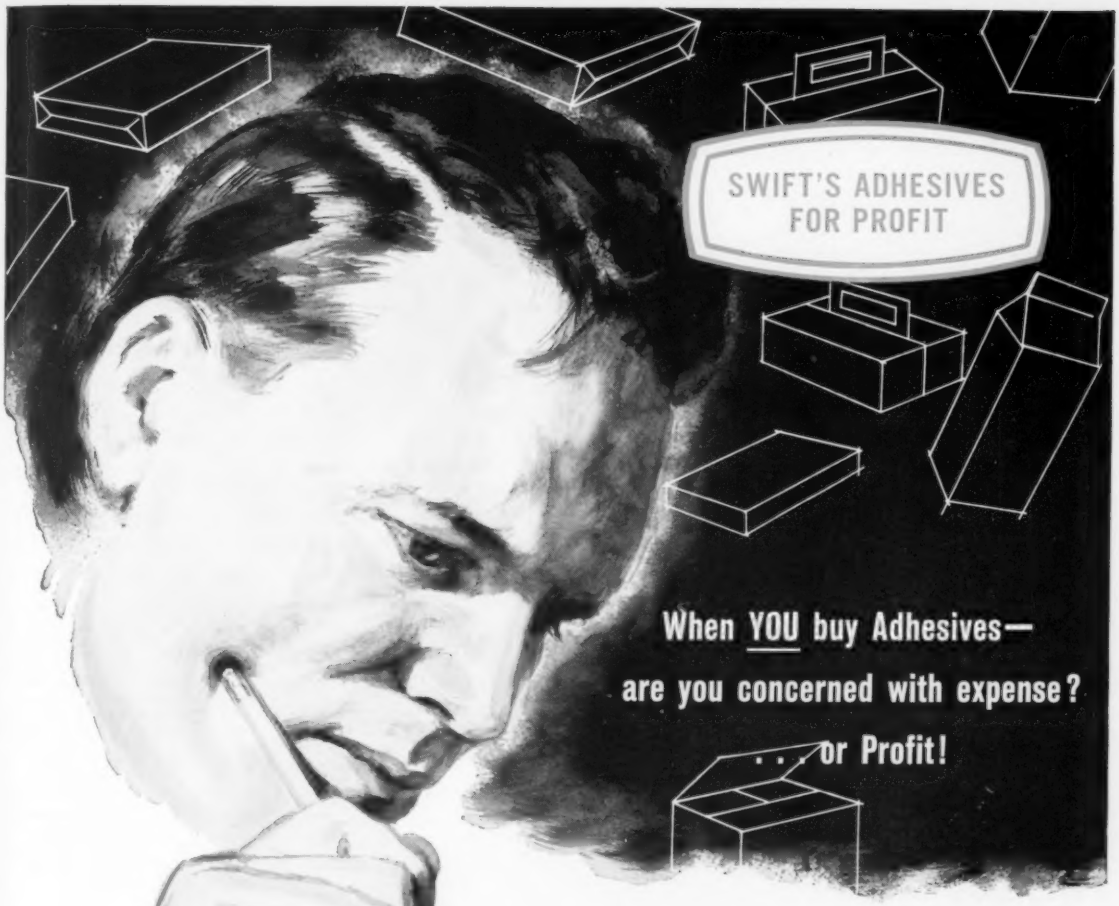

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2A. BAG FOLDING

The feed roll unwinds continuously because of its considerable weight, while the rest of the machine runs intermittently. To make the transition from continuous to intermittent motion smoothly, several meters of the packaging material are drawn from the feed roll into a "sack," and delivered from the sack to the sectioning shears. This sack always contains a quantity of the roll stock during machine operation. If the transition were not made by this, or some other comparable means, large tensile stresses would occur in the web and could lead to failure or permanent elongation of the packaging material.

The section of material then passes to the bottom surface of a block-shaped mandrel, a (see Fig. 12). Two sliders, b, move upward over the side surfaces of the mandrel. Two other sliders, c, fold the surfaces of the section protruding above the mandrel around its upper corners. To be shaped satisfactorily around the mandrel by the sliders, the packaging material must possess a certain minimum stiffness. This will prevent the upward protruding surfaces from collapsing or hanging down.

Machine Design Important

It is very difficult to determine a quantitative value for the minimum stiffness, since it depends on the dimensions of the unit section of material. A short section would be expected to cause less difficulty than a long one. This is one of the instances where a test provides the quickest way to an answer. If, for technical reasons connected with the manufacture of the packaging material, an adequate stiffness cannot be attained, the problem must be solved by the machine designer by means of built-in supporting devices.

When the seal is already made in a section, quite a different case arises when this section, shaped around the mandrel, tries to spring back into its original position. This can result in a seam being drawn apart. The manufacturer must supply a material which, after shaping around the edges of the mandrel, possesses only a slight resilience. If the radius of curvature of the corners of the mandrel is known, the corresponding tolerated spring-back angle can be calculated from the $lg2\rho$-ϕ-diagram.

"Pliability Factor"

As with bag machines, a value of 20° to 30°, under the prevailing conditions of processing (humidity and rate of creasing), should not be exceeded. The fact is unimportant that, in folding around the former, we are dealing with 90° creases, whereas, on our crease testing apparatus, 180° creases are made. This is because only the *ratio* of the measured spring-back angle to the total possible spring-back angle (90° or 180°) is significant for the effect of resilience. Since this ratio is a measure of how well the packaging material conforms to the shape of the mandrel, after the forming, we term the ratio the "pliability factor." Thus,

$$S = \frac{\phi}{\text{Max. pos. } \phi} \text{ for } \rho = \text{Constant}$$

where S is the pliability factor, ϕ is the spring-back angle, and ρ is the radius of curvature. Therefore, pliability, or permanent creasability, of a packaging material is not a material constant, but is dependent upon the radii of curvature of the mandrel.

Another crease occurs in the bottom folding on the mandrel. Two sliders, d and e (see Fig. 12), successively fold inward the two opposite surfaces of the section protruding from the top of the mandrel. Then, the two flaps perpendicular to these are folded inward and gummed.

Pinholes Can Form

As with block-bottom and satchel-bottom bags, formation of the corner is problematical. If the packaging material is very stiff and its

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elongation-to-rupture is low, pores may very easily form (see Fig. 11).

If material elongation is insufficient to avoid pinhole formation, we advise coating the packaging material with a tight film having high elongation-to-rupture and to which only a small stress can be applied compared with the supporting material. This insures good barrier properties, without affecting the resilient characteristics of the supporting material. After forming of the inner bag, the outer bag or carton is folded; these stages involve the same principle as for the inner bag.

2B. FILLING

Filling of the package takes place on the second turntable, but involves no mechanical problems pertinent to this article.

2C. CLOSURE FOLDING (HARMONICA CLOSURE)

The harmonica closure consists essentially of four *very different* creasing processes (see Fig. 13a). In Stage 1, two knives stretch the top of the bag open, thus folding the packaging material in two places to a radius of curvature ρ, determined by the sharpness (radius of curvature) of the knife. Two pressure plates, which can also serve as welding platens, press (Stage 2) the bag section flat. With an output of 60 bags/min., this operation takes place in about 0.1 sec. Assuming that the radius of curvature ρ of the outspread bag section is about 1 cm. (0.4 in.), we can calculate the feed rate $d\rho/dt$ of the pressure plates as follows:

$$\frac{d\rho}{dt} : \frac{\rho \cdot \delta}{dt} = \frac{1}{0.1} = 10 \text{ cm./sec.}$$

$$(\sim 3.9 \text{ in./sec}),$$

in which the packaging material thickness δ can be neglected in comparison with ρ. This feed rate can be achieved with the crease testing apparatus so that weakening of the material, due to this type of crease, can be measured. However, one must remember that the feed rate on the testing apparatus is approximately constant, while the feed rate of pressure plates in the machine is not constant. The value 10 cm./sec. only represents an average over the distance of the feed. For purposes of calculation, however, the error due to this can be neglected.

Individual Steps For Forming

Four or five knives form the actual harmonica in Stage 3 of Fig. 13a. The individual steps of this operation are shown in Fig. 13b, and take place as follows: A flat knife, 1, anchors the packaging material, a second knife, 2, then forms a 90° crease, whereupon a third knife, 3, bends a 180° crease, and so on until all creases are made. Curvature of the packaging material in each crease is again determined by the thickness of the respective knife. As shown in Step F, the knives withdraw, and simultaneously a plate from above compresses the harmonica folds against the package, since they tend to rise up again because of the material's resilience.

Actual creasing takes place in about 0.07 sec. To calculate accurately the velocity of motion $d\rho/dt$, one must consider the velocity/distance curves of the individual knives. This involves an unnecessarily large amount of work for most purposes. The average feed rate is of the same order of magnitude as that of the pressing plates, namely 10 to 20 cm./sec. ($\sim$ 4 to 8 in. sec.).

Reproduce Creases On Tester

With the knowledge of the rate of creasing, we can reproduce these individual creases fairly easily on the testing apparatus by first creasing the packaging material according to the second stage in Fig. 13a. Follow this procedure:

Shape by hand a cylinder [height 5 cm. ($\sim$ 2 in.)] from a strip of the packaging material measuring 50x20 cm. ($\sim$20x8 in.) and glue the seam. Place the cylinder vertically in the testing apparatus and crease with a gap setting of $d=2\delta$. Next, fold this flat, double layer

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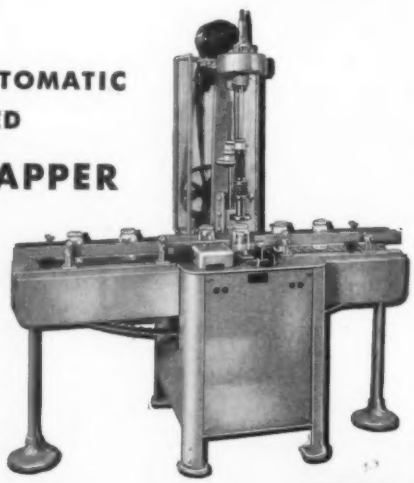

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of material into a U-shape and insert it into the creasing apparatus with the fold uppermost. Crease this material with a gap setting of $d = 2\rho + 2\delta$, where ρ is the radius of curvature of the creasing knife on the machine, and δ is the thickness of the material.

In this way, a crease of the harmonica has been reproduced and the perviousness of the material can be measured. If we multiply this value by the number of creases in the harmonica closure, we obtain a value for the perviousness of the folds, accurate enough for practical purposes.

After folding, the harmonica is compressed into the package as shown in Stage 4 in Fig. 13a. The outer carton is then sealed, completing the closing operation.

Summarizing, stresses imposed on the packaging material by automatic packaging machines, which can reduce the barrier qualities and strength of the material, consist essentially of those occurring in the creasing operations. The necessary properties, as well as the possibilities of converting the packaging material to improve the creasing behavior, are pointed out in the discussion of bag machines *(3)*.

To insure satisfactory movement of packaging material by the sliders in forming the section of the inner bag around the mandrel, a certain minimum stiffness is required. This must not, however, be excessive because of the danger of pore formation at the corners of the bag bottom.

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(Part III, concluding this article, will appear in our next issue.)

Part V—Developing articulate, workable specifications

Practical pointers to better folding carton performance

As carton users learn more and more about their own requirements, they begin to crystallize these into specifications. Usually, their efforts at specification writing run in either of two directions—*material* specifications or *performance* specifications. In other words, with a material "spec" the user gives the carton manufacturer every detail of board—finish, caliper, basis weight, surface treatment, and so on. But with a performance type of requirement, the user merely asks for a stated performance, i.e., results.

Carton users argue this point both ways. Some large users feel that detailed material specifications are necessary so that carton manufacturers all over the country can produce a uniform carton for a nationally distributed product. Others believe it more important to tell the carton maker just what performance they want and hold him to that.

This is where the point of difficulty lies; a user may have a thoroughly detailed material specification and the carton producer may meet it to the letter—yet, the carton performance may fall short of expectations. This is apt to happen when the material specifications do not properly relate to performance requirements. Generally, when it does occur, it is because of one or more of the following reasons:

1. Inexperience of the personnel drawing up the specifications or their remoteness from the packaging operation. (Not infrequently, in package-using national corporations, someone in quality control in Podunk is responsible for issuing specifications for packaging operations in Keokuk, Los Angeles, and New York, with which he is not too familiar and which, on occasion, he has never seen.)
2. Specifications were "borrowed" blind from a user who knew what he was doing, but who was doing it on different equipment and possibly under different conditions.
3. The user has not made its suppliers fully conversant with the performance requirements nor shared with them the details of the packaging operation.
4. Before issuing the specifications, the user has failed to counsel "both ways"—with its package suppliers and with its own operating personnel.

Carton manufacturers who urge greater use of performance specifications cite the success of users who leave material details out of specifications and, instead, just tell what the carton should do.

No Universal "Spec"

Most carton users and suppliers alike agree that there is no universal specification. Rather, the individual needs of packaging any given product dictate tailoring to those needs the detailed requirements stated in the specification. This means, as carton manufacturers stress repeatedly, a user should avoid copying or "lifting" the specifications of some well-known company because the result is usually a disappointment.

Many package users fall into the trap of thinking that what is good for the large producers of food or soap or toiletries must be good for them too since these nationally known companies have the talent and resources to research out the best possible carton specifications. But this usually is not so. Not only are the performance requirements different, but also the structural and functional tolerances within a given specification.

Set Out Rquirements

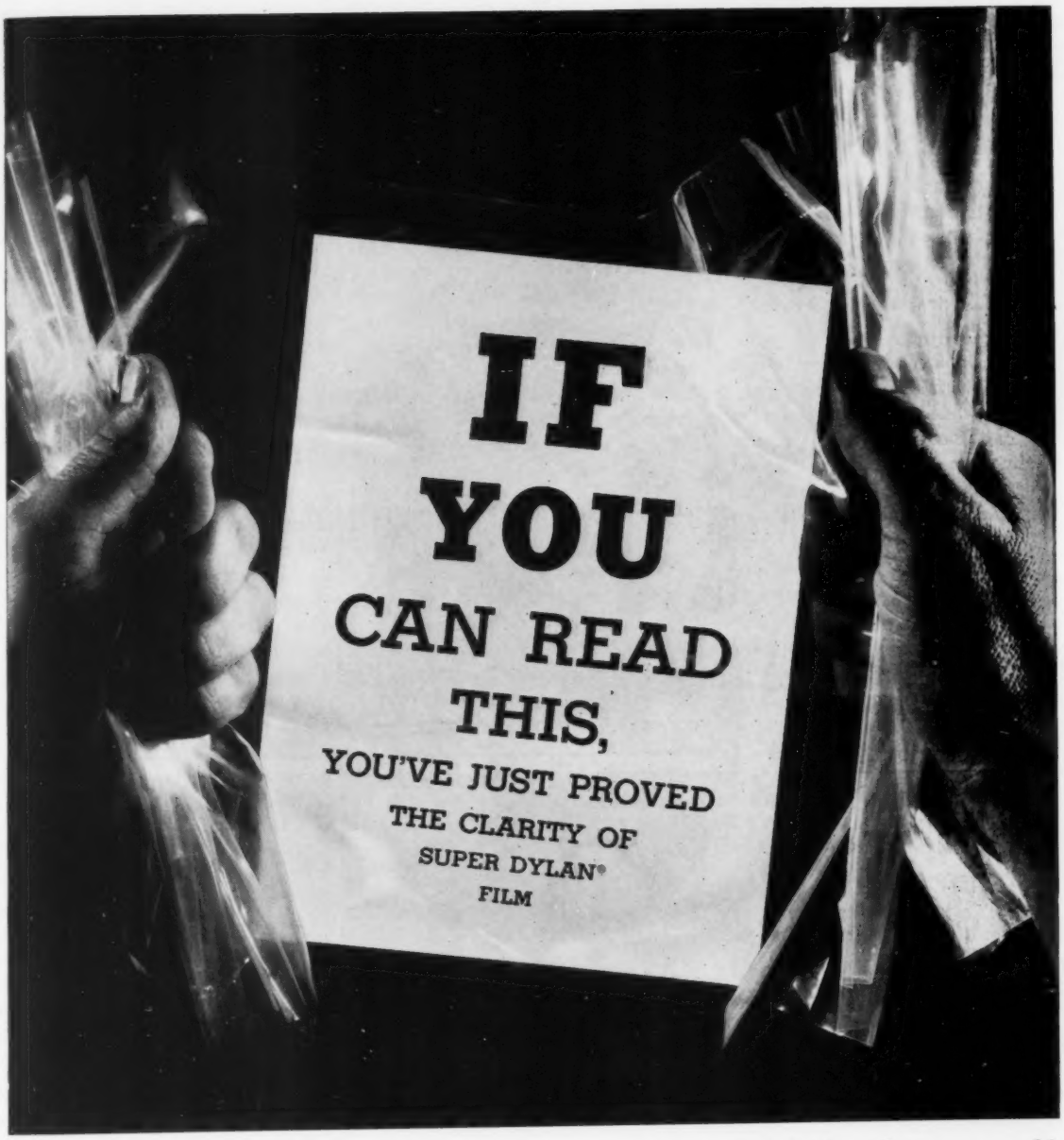
Starting point of developing a good specification is to catalog the requirements of just what a particular carton is supposed to do. Where automatic machinery for carton forming, filling, and closing is involved, a good basic requirement is to specify that, "cartons shall perform *consistently* well at high speeds." Better still, in this case, specify the speed range. Specialists in cartons point out that prevalent specification thinking and planning does not put enough emphasis on consistency as a basic requirement for cartons to meet.

This suggests that requirements of consistency indicate a need of systematic checking of cartons received—in other words, the use of quality control. However, many efforts to relate statistical quality control and folding carton specifications can lead to difficulty for the user. The basic problem is simply that the more a user requires in the way of quality control restrictions, tighter limits, *et al*, the more its cartons cost.

Know What To Require

All this turns attention to the fact that specification writing, quality control, and carton requirement details are *relative*—relative to the final product and relative to all its packaging details and performance requirements. For example, how a carton is filled and closed on a packaging line governs what its requirements must include.

Suppose, for instance, that a certain carton goes through a hand filling operation. This invariably



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means that tear strength is not too important as a property from the standpoint of the filling operation. On the other hand, it may be desirable to have a specific inner liner in order to prevent checking* along the inner bead score. Similarly, bending properties (in particular, uniformity of bending) are not especially important with a manual cartoning operation.

Are Requirements Relevant?

In other instances, where automatic machinery is involved (and usually with increasingly higher speeds), bending properties take on more and more importance. Many users are taking an increased interest in the converting and carton manufacturing operations in order to be sure that desired bending, for example, is furnished. Carton specifications are becoming more specific in regard to prebreaking, a subject which was discussed at length earlier in this series.†

From the standpoint of specification development, the big lesson is that requirements should have a reasonable relationship to the needs of the carton and the packaging function it has to perform. In this connection, package users ought to be sure that any tests they include in carton specifications are pertinent and useful. A common difficulty is that users often specify tests which are more useful to suppliers than users—tests which have little relationship to good performance—unless closely tied in with the particular performance by a given carton.

Let Supplier Furnish Performance

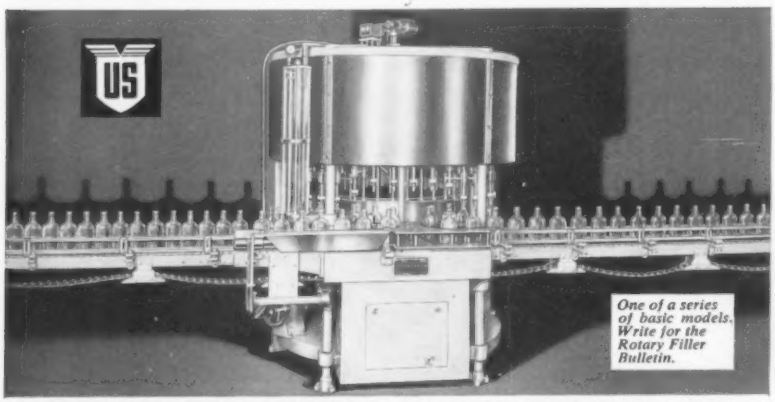
Requirements and tests for stiffness, tear, slip, and the like often are less useful to a package user than to a supplier. Statements of required caliper, basis weight, Mullen test, etc. also fall into this category. Many suppliers and some users feel that a carton manufacturer should exercise its judgment on these.

All this assumes that a user has specifications which spell out performance as articulately as possible. For example, to specify a certain style of carton, for a given product, to run at a specified speed, and on a stated model of packaging machinery is to spell out performance. It then becomes the responsibility of the carton maker to turn out cartons that meet that requirement.

Standards Needed

The competitive status of the folding carton market is adversely affecting the development of carton specifications, users and suppliers alike admit. In other words, carton makers strive to meet the intricate and detailed requirements of users and failure to do so means, more often than not, the loss of the business to another carton maker who will meet them. The trouble is that frequently, users neither need, nor benefit from, the de-

*Part II of this series, PACKAGE ENGINEERING, 5 (1960), No. 2 (Feb.), p. 71.
†Part III of this series, PACKAGE ENGINEERING, 5 (1960), No. 4 (April), p. 96.



One of a series of basic models. Write for the Rotary Filler Bulletin.

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Wherever famous liquid products are packaged, there you are most likely to find a custom-built pace-setter — the U. S. Rotary Vacuum Filler. Throughout the liquid packaging world this great machine is custom-engineered to the requirements of the packaging line it heads. That is why no two U.S. Rotary Vacuum Fillers are ever alike—or why this versatile, automatic machine can never be outmoded.

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Most Versatile Multiple Filler
MODEL B-49 STRAIGHTLINE VACUUM FILLER. Fills 4 to 9 containers simultaneously; up to 50 small containers p.m. Lever engages and disengages filling stems, otherwise operation is automatic. Adjustable for all container heights up to 14"; miniature and standard finishes, gallon F-style cans, wide mouth jars. Stainless steel filling stems; plastic on order. Conveyor optional. Write for "Bulletin B-49."

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tailed material requirements enumerated.

Many users complain about a lack of standardization in the field. Probably the nearest approach to standardization is the nomenclature used and advocated by the Folding Paper Box Association of America. Whatever its shortcomings, this nomenclature does help in defining some of the fairly standard carton constructions—and in preventing the application of several different names to the same construction or style.

Use Tests With Care

Similarly, tests are a means of applying uniformity to carton specifications. When a user specifies nationally known tests, for example, those of the Technical Association of the Pulp and Paper Industry or other recognized standards, it is using terms the industry generally understands—and which are available for reference. But, it is imperative that any user incorporating tests into its specifications know what the tests are and what they reflect.

A common pitfall is that a user specifies a test for a given tear resistance when it really wants a certain bursting strength requirement. Troubles of this sort sometimes arise when one company borrows the specifications of another.

Adjusting Differences

A still different situation arises when a company wants to interchange cartons which have been obtained from several suppliers. Some users have pinned down their specifications so thoroughly that they can run cartons from different suppliers without having to stop and adjust machinery. This usually means that a user first works out its specifications with each of its suppliers, after which it modifies all the specifications in terms of the tolerances of each supplier. In other words, the resulting carton represents the reconciled individual differences of the suppliers—adjusted to the common requirements of the user.

Compromising Of Needs

This is another way of saying that practical performance requirements spelled out in a specification mean compromises. In some cases, it is a compromise in the form of leaving out requirements not absolutely necessary. In other situations, it is not as much the performance or quality requirements a user wants, but what level of quality it can afford.

Insistence on certain standards of performance or quality control may add to a user's costs beyond the point of sufficient economic return from the added cost. For this reason, many users who are experienced in drawing up specifications and standards point out that their standards are "not too tight." Perhaps a spot-check on suppliers rather than full-scale statistical sampling assures suitable carton quality and performance.

(Turn page)

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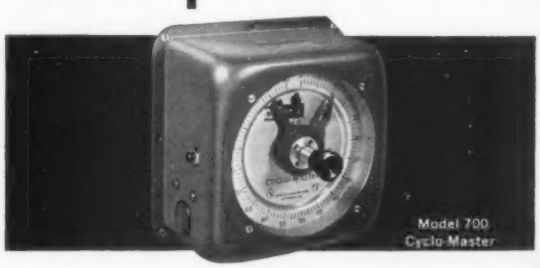

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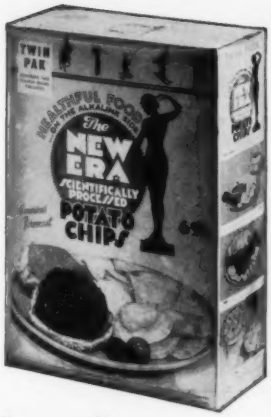

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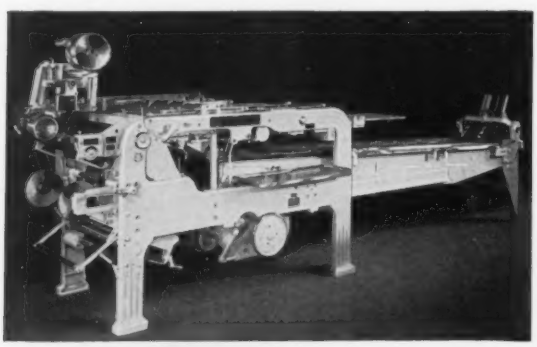
There's an automatic transfer for automation lines.
Choose from 8 models that can handle up to 50 packages a minute. Get all the facts! Or if you have a special wrapping or labeling problem, get in touch with "Oliver."



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Material And Performance

Still another aspect of developing carton specifications is drawing on the best features of material and performance requirements. This is an alternative to the "either-or" concept of material *versus* performance specifications. Some users following this approach say it represents a material-and-performance approach.

For example, a food company specifies the type of board, caliper, basis weight, and so on and gives the supplier prints of container style, scoring, and such details. The carton maker, thus, is free to develop the rule details, width, depth, penetrations, *et al* which are most suitable for the particular cartons. Even with this specification, the supplier gets some latitude regarding choice of board.

Another company goes even farther and, in its specifications, orders board in terms of odor-freeness, stiffness, tear resistance, moisture content (board too dry does not form properly; board too wet does not hold a glue bond quickly), and so on. Other requirements enumerate TAPPI tests so that user and supplier are testing for the same things.

Is All This Necessary?

But in spite of the success of some companies in being this articulate in carton specifications, many suppliers raise a question concerning just how necessary it all is. They say the user would be better advised to spend that effort examining its performance needs—all the way from packaging line to point of use. Carton makers say they can do a better job where they know the exact performance that will be expected of the carton.

Thus, they urge user companies to spend their research time studying and clarifying their needs instead of going into detail about board, caliper, moisture, and the like. For example, not enough attention goes to the problems of how cartons are shipped. Not enough companies tell their carton manufacturers the entire chronology of the conditions to which their particular cartons are subjected.

Large or multi-plant user companies find multiple suppliers a practical obstacle to strictly performance specifications. Consider, for example, the plight of a national user company purchasing cartons from five suppliers (a not uncommon occurrence), if it were to issue *only* performance specifications. Supplier A might choose to provide this performance with a 0.016-in. "regular-density" solid bleached sulfate; Supplier B with a 0.020-in. white clay coated news (special white lining over the news); Supplier C with an 0.018-in. bleached sulfite on two sides and a Manila center; Supplier D with a 0.019-in. "low-density" solid bleached board; and Supplier E with a 0.017-in. natural kraft having on top a solid bleached or special white coating.

Each supplier might have valid competitive reasons for wishing to furnish the particular board that will do the job. Yet, the user who has to run these cartons interchangeably, one behind the other, would have the machine down more than it would be operating in order to make the machine changes and adjustments necessary to permit each set of cartons to run. Therefore, the large user (who must have multiple suppliers) finds it imperative to include *some* material specifications to insure that cartons from *all* suppliers shall perform consistently well at high speeds without machine downtime when switching from one supplier's cartons to another's.

People "On The Line" Help

Another aspect of specification writing often overlooked is the importance of making sure that user and supplier understand each other's operating conditions. Hand-in-hand with this is the importance of letting the people "on the firing line" participate in specification development. Their experiences and observations are important.

Likewise, visits between user and supplier give understanding to requirements and give significance to tolerances. For example, many users fail to appreciate that carton manufacturing is still an art and not a science. In spite of the inroads of automatic controls and the like, it still depends on the individual skill of men for success. In other words, practical development of specifications depends on knowing just *what* a carton plant can actually do toward turning out a carton to give the desired performance.

Know Your Needs

But this does not mean that carton manufacturing has failed to keep pace with high-speed mechanization in package-user plants. The widespread success of high-speed cartoning shows that it has kept pace. Rather, from the standpoint of the user seeking to work out articulate specifications, it simply means that the one fundamental approach is to make sure the carton manufacturer knows all about the performance the user wants. Unless the user articulately communicates to the supplier the job the carton must do, all the material requirements and details are of no avail.

And from a positive standpoint, the writer of specifications needs to know and understand:

1. What the carton is to do;
2. How the carton is used, run, and handled to the point of final use (and occasionally to the point of discard);
3. Just what the box maker can do to turn out a carton meeting these needs.

Detailed requirements and laboratory tests refine and augment the value of cartons, resting on those basic requirements. But, without the requirements, the tests prove nothing.

(Next article—the final part—in this series will discuss user-supplier relations, pointing out the need for good communications, mutual understanding, and sharing information.)

Book review

Automation is explained in new book

Management's function; roles of the inventor, the engineer, the designer, and the builder—when involved in automating an operation

"Automation" is often thought of today as a term for a completely automatic operation—one which performs unattended by the human being. It can mean this, and does sometimes. Mr. George F. Hawley, in his new book, *Automating The Manufacturing Process*, says that automation is an executive function, an administrative attitude, the technique of making things automatic, the accelerated search for more labor-saving machines—all summed up as "Automation—A state of mind," the heading of his first of 14 chapters.

The book is not an engineering treatise and it is not technical. Rather, it offers help in a down-to-earth manner to those persons contemplating some form of automation—whether it be a gadget to help an operator apply a special label to a package, or be the development of a whole machine to do a specific job, or be the installation of a complete line.

To management and production people, the author explains the economic feasibility of automating, and points out the risks which can be involved. For the machine designers and development engineers, he gives hints and ideas which should help cut down on failures in a given project. To do this, he uses some very interesting examples—simple, but thought-provoking, such as how to feed folded, block-bottom paper bags, all pointing in the same direction, onto a moving conveyor.

Each example is well illustrated with line drawings, and an explanation of the problem and several detailed progressive approaches to the solution are given.

One of the main themes Mr. Hawley stresses throughout most of the text is his confirmed opinion that the management function of a company is a very necessary part of developing automatic equipment. He also maintains that invention, engineering, design, and building of a piece of machinery should be separate concepts—there must be cooperation, however.

Following a logical sequence, he tells how to go about getting started, how to determine the type of machine needed, and he explains the importance of building a model. Carrying on through the engineering design, and building phases, he ends with the debugging process and the run-in period. Again, he uses interesting examples to get his points across.

Interestingly written, the 147-page, cloth-bound book contains 63 illustrations—mostly well-prepared line drawings, and several tables. Recently published by Reinhold Publishing Corporation, New York, the book is available in most bookstores carrying technical books. Retail price: $4.95.—H.E.V., Jr.

Chaffee Heat Seal Label Applicator and Heat Sealer

A. Filled bag being put into infeed of heat sealer
B. Bag being conveyed to awaiting Label 4
C. Bag activating switch that activates placement
D. Bag entering heat sealer
1. Label folder
2. Cut label awaiting action of "label folder"
3. Folded label & bag being conveyed to sealer
4. Label resting on folding mechanism
5. Twin belt label conveyor
6. Knife

NEW! Exhibiting for the first time the CHAFFEE HEAT SEAL LABEL APPLICATOR which automatically places the label header on to the filled bag; then bag and label conveyed thru the heat sealing machine on a production line basis.

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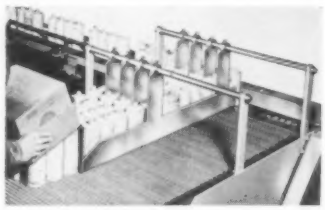
1—Container Feeder

An operator dumps containers on the unscrambler belt of this new unit and the machine feeds containers to the



packaging line at any speed at which the line can absorb them. The maker says that its precision feeding assures smooth, steady packaging at high speeds. Unit handles round, square, panel, and oval cans and containers. For more information write: U.S. Bottlers Machinery Co., Dept. PE, 4009 N. Rockwell St., Chicago 18, Ill., or *circle number on card.*

2—Plastic Netting

Vexar polyethylene netting is a new material manufactured by a process that extrudes polymers directly in net form through a single operation. In this way, each strand intersection becomes an integral part of the material in contrast to interwoven or heat-sealed netting where joints are made after the material is extruded. Produced in tubular form, strands can be made thicker than a pencil lead or as fine as a coarse thread. Mesh size can vary from 16 strands/in. to more than 1 in. between strands. Material can be used as a bag for produce and fruit and as a protective and tamper-proof jacket for bottles and cans. For more information write: E. I. du Pont de Nemours & Co. (Inc.), Film Dept., Dept. PE, Wilmington 98, Del., or *circle number on card.*

3—Collector-Converger

Model PNES is a straight line collector-converger to accumulate cartons from several unbalanced lines. It automatically converges these lines into a single line for feeding to a case packer or filler. The unit can be used for any objects which stand upright on conveyors and works on a demand principle with the fullest line being released first. It can also be used in prearranging mixed packages or packs where a variety of products go into the same case. Operating speed is 240 packages/min. For more information write: Industrial Assistance Co., Dept. PE, 30052 Cherry Hill, Garden City, Mich., or *circle number on card.*

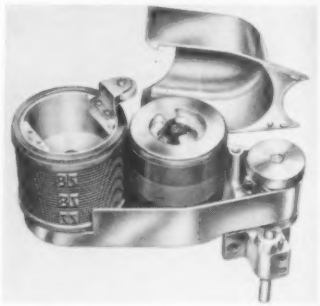
4—Pillow Bag Packager

Pillow-type packages are formed, filled, and sealed by the automatic Advanced Bagmaster. New features

of the machine permit gentle and precise packaging of such fragile and multi-dimensional products as potato chips, the maker says. To its hydraulic displacement weighing principle is added a sensitive electronic detector. Operating controls are contained in a recessed control panel, and illuminated pushbuttons indicate proper operation of the hydraulic valves, and may be used to actuate individual machine functions manually for set-up or maintenance purposes. For more information write: Wright Machinery Co., Div. of Sperry Rand Corp., Dept. PE, Durham, N.C., or *circle number on card.*

5—Multi-Color Coder

Production coding, marking, and printing in 3 colors at once is now possible with the development of



Model 603 Teko Coder. The machine prints a legend 3 in. high and up to 15 in. wide, using as its ink supply 3 Porelon plastic, solid-ink rollers. Unit is fully automatic, friction operated, and the locking devices which hold both the ink cylinders and the printing head allow for quick change-over of either. The plastic cylinders hold enough ink in suspension for the printing of up to 150,000 legends—ink which can neither drip or gum up, the maker asserts. For more information write: The Thomas Engineering Co., Dept. PE, 9257 N. Laramie Ave., Skokie, Ill., or *circle number on card.*

6—Label Adhesive

A vinyl resin-based paste has been developed for can labeling operations. Designed for use on a wide range of label stock including varnished and plastic coated grades, the new adhesive is called Cascorez CV-704. The producer lists such advantages as more coverage than vegetable types, low viscosity, moisture resistance with non-warp properties, fast setting, and allows increased label machine speeds. The product is available in 5- and 55-gal. drum sizes. For more information write: The Borden Chemical Co., Dept. PE, 350 Madison Ave., New York 17, N.Y., or *circle number on card.*

(Turn page)

A winning team

needs a "strong bench". When you buy Duraglas containers or their closures from Owens-Illinois, you acquire the rights to a "strong bench" of technical and merchandising skill.

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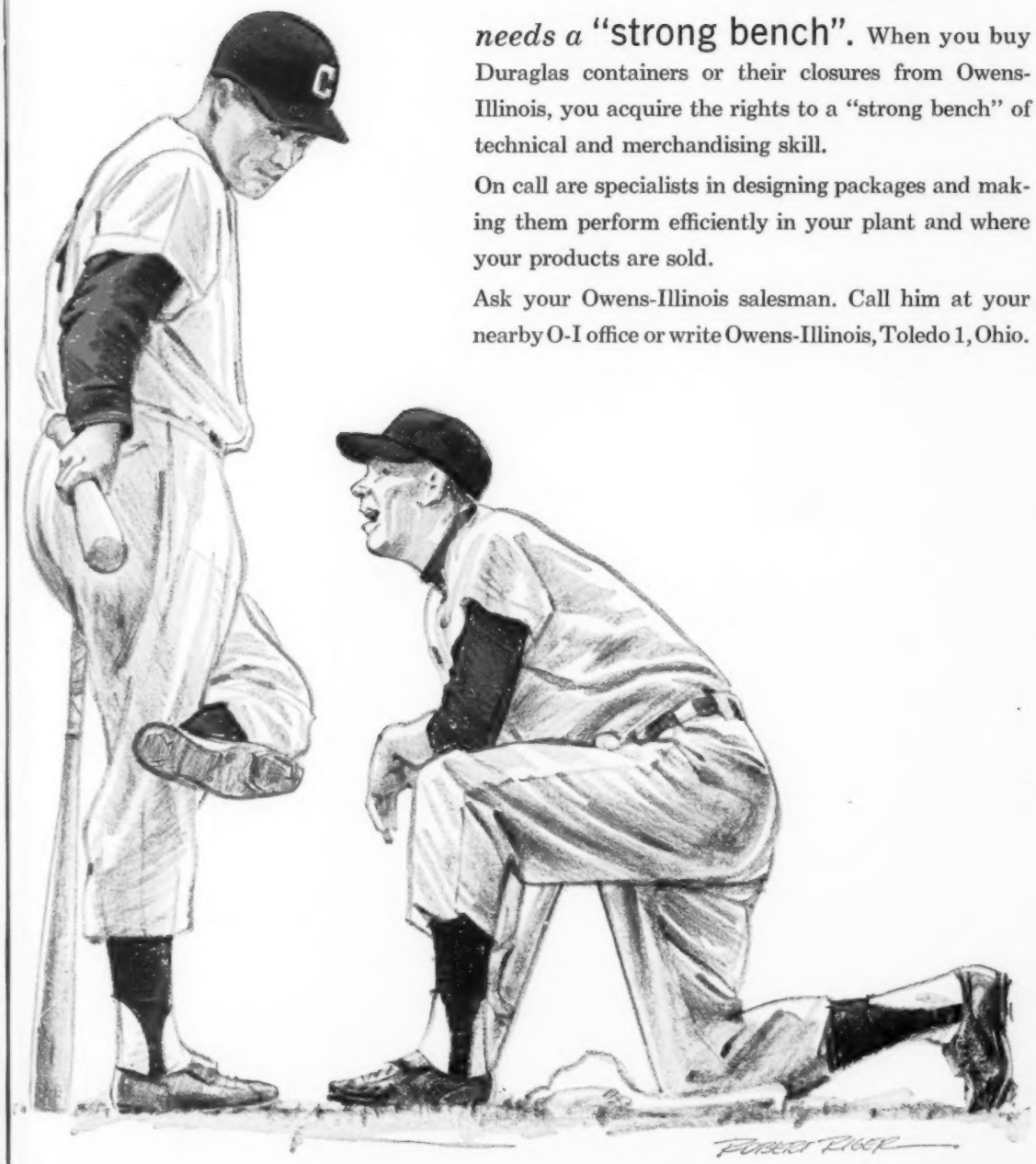

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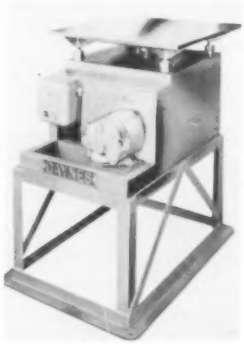
7—Vibration Tester

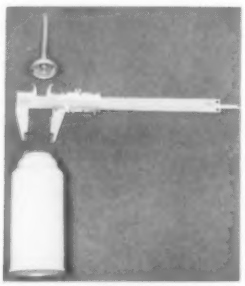
New and available is the style No. 25-VH production type vertical-linear vibration tester. It has a maximum



capacity of 50 lb. and is capable of giving an output force of from 0.05 to 5 G's. Vibration frequency is adjustable from 10 to 20 cycles/sec. Machine is equipped with starting control for ½ h.p. motor, synchronous interval timer for automatic turn-off, and r.p.m. indicator. Tester may be used on the production line or in the laboratory. For more information write: Gaynes Engineering Co., Dept. PE, 1644 W. Fulton St., Chicago 12, Ill., or *circle number on card.*

8—Aerosol Caliper

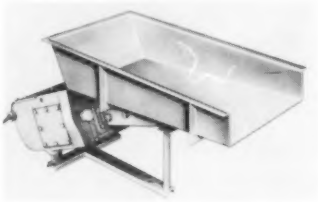
A modified design of the Vernier caliper provides a flexible measuring instrument for aerosol containers.



Micrometric measurements of all essential parts of the container and the valve are accessible. Valve dimensions and crimp for i.d., o.d., crimp locations, crimp depth, edge roll, depth of cap, container diameter, height (to 6 in.), and other dimensions subject to quality control are accessible and measurable to 0.001 in. The tool can also be used to measure machine adjustments and crimping tool settings. For more information write: De Gray Design Inc., Dept. PE, 900 - 25th St., West Palm Beach, Fla., or *circle number on card.*

9—Light-Duty Feeder

Development of a new light-duty vibratory feeder, model F-212, has been told. Unit is said to be capable of feeding most any dry bulk materials from fine powders to coarse



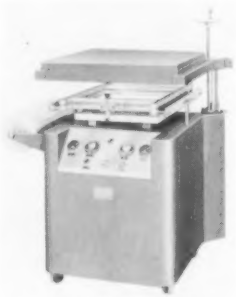
granular bits and chunks at rates up to 50 ft./min. The feeder may be fitted with various sizes of flat pans or tubular troughs and is furnished with control box and a completely enclosed electromagnetic drive unit. For more information write: Syntron Co., Dept. PE, 269 Lexington Ave., Homer City, Pa., or *circle number on card.*

10—Adhesives For Polyethylene

A group of adhesives, identified as Series 470 adhesives, has been developed for labeling polyethylene bottles. Within this group are single adhesives that handle both non-treated and treated polyethylene. Manufacturer says these products are characterized by speed of set, high degree of water resistance, and strength of adhesion. For more information write: The F. C. Findley Co., Dept. PE, 3033 W. Pemberton Ave., Milwaukee 45, Wis., or *circle number on card.*

11—Skin-Packaging Machine

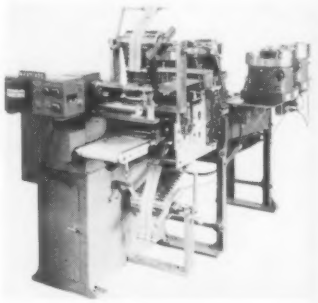
Several improvements have been added to the Model 24 Pak-O-Vac automatic skin-packaging machine.



Infrared ovens have been enlarged, a re-designed reflector provides more even distribution of heat across film, vacuum reservoir capacity has been doubled, and improvement of the "feathering valve" control allows for more sensitive vacuum control. Maximum platen size is 20x20 in., maximum depth of draw is 7 in. Most thermoplastic films for skin packaging can be used. For more information write: Product Packaging Engineering, Dept. PE, 5713 Joanne Place, Culver City, Cal., or *circle number on card.*

12—Tablet Packager

For packaging dusty, fragile products such as corrosive chemical tablets, hard candies, etc., Model UPC-H Unit Packager has been developed.



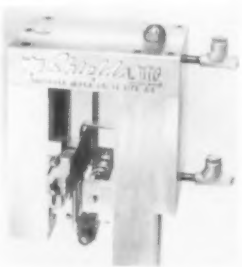
The tablet packaging machine has a vertical feed with a horizontal sealing head and the feed system is as far from the sealing section as possible, thus eliminating the possibility of dust and chips causing rejects, the manufacturer states. Single rows of 150 packages/min. or multiple rows can be run. For more information write: Wrap-Ade Machine Co., Inc., Dept. PE, 188 Sargeant Ave., Clifton, N.J., or *circle number on card.*

13—Polyurethane Cushioning

Virgin K-foam, polyurethane foam cushioning, is being distributed by the newly formed special products div. of this company. The material is said to meet all prevailing government specifications for cushioning and in most applications reduces the amount of cushioning material necessary because of its shock absorbing qualities. Converting facilities for various shapes, die-cuts, laminations assembled parts, and stock size sheets of 24x72 in. are available. For more information write: Henry B. Katz Industries, Inc., Dept. PE, 45-47 Hollywood Plaza, East Orange, N.J., or *circle number on card.*

14—Coding Attachment

The development of a coder-printer attachment for coding, dating, or printing collapsible tubes has been



announced. The design of the Shields unit permits attachment to any machine at any stage of tube processing

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KEEP REFRIGERATED • NET WT. 4 OZ.
ARMOUR STAR
genuine
DRIED BEEF
wafer sliced
U.S. INSPECTED AND PASSED BY DEPARTMENT OF AGRICULTURE EST. 2A
TEAR HERE
PACKED BY ARMOUR AND COMPANY GENERAL OFFICE CHICAGO, ILL.
Package covered by Patent No. 2,466,199
TEAR HERE

THERE'S MORE THAN DRIED BEEF IN THIS MILPRINT PACKAGE

There's imagination, skilled research and quality production in the rotogravure printed lamination of film, foil, adhesives and thermoplastics. This package protects both the product and its maker's opportunities for initial *and* repeat sales. / There's a typical example of the right *custom combination* of materials and printing process at economical cost—the result of Milprint's "open mind" approach that favors no particular material or printing process because *Milprint offers you the widest variety available anywhere.* / There's a quality food product and a famous brand name—another combination typical of Milprint, flexible packaging's pioneer company. / Bring your next packaging problem to us and discover . . .

MILPRINT PACKAGING *gives your product* MARKETING POWER

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World's Most Resourceful Flexible Packaging Service.
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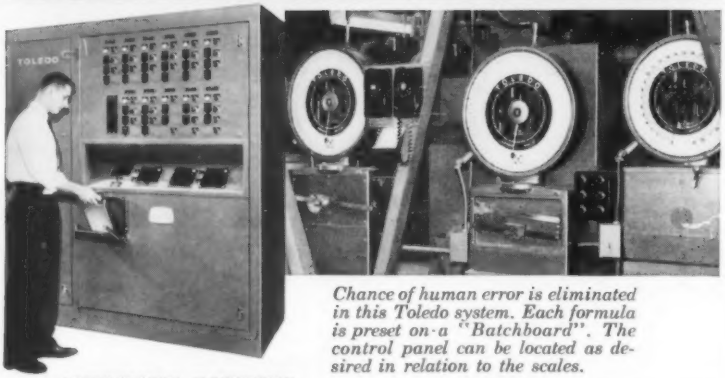
TOLEDO Reports on Automatic Weighing

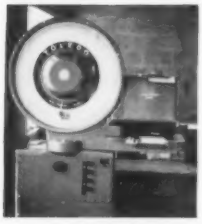
★ NEW IDEAS FOR COST-SAVING



Chance of human error is eliminated in this Toledo system. Each formula is preset on a "Batchboard". The control panel can be located as desired in relation to the scales.

AUTOMATIC BATCHING

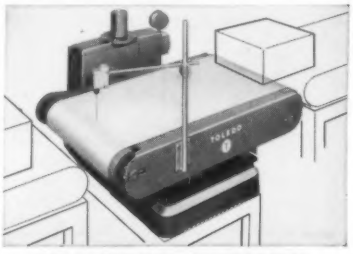
Operator at convenient remote location has full command of a multiple scale batching system with Toledo Remocon. As many formulas as required are pre-set on "Batchboards" and inserted into panel. This is one of several types of Toledo remote-control batching systems for today's needs, including punch card, "Formulaplug" and digital scanner. Ask for Bulletin 2964.



LOAD CELL DIAL DOES TRIPLE DUTY

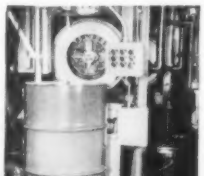
. . . ALSO PRINTWEIGH RECORDING

One remote dial serves *three* platforms in this Toledo Electronic Load Cell Scale for truck weighing at a large cement plant. With a truck on three platforms, scale reads individual axle loads or total weight. Equipped with Printweigh "400" to print full figure weight data. Brings new versatility to weighing. Request Bulletin 2970.



CHECKWEIGHS IN-MOTION

Many plants today are putting Toledo Automatic Checkweighers into their conveyor lines. Models to provide continuous, 100% in-line checkweighing of items from a few ounces to 200 pounds. Motorized belt. Handle sacks, cartons, packages, pieces, parts. Ask for Bulletin 2968.



AUTOMATES DRUM-FILLING

In this oil industry plant, a Toledo sub-surface filler automatically eliminates foaming and controls drum filling. The scale is keyed into conveyorized system . . . provides faster, more accurate filling. Saves time, labor, avoids loss of material and customer goodwill. One of many operations where Toledo controls guard costs. Ask for Bulletin 9030.

●

WRITE TODAY for specialized help from our Custom Products Division, or contact the Toledo Office near you, to solve your problems in batching, checkweighing, drum-filling, load cell applications. TOLEDO SCALE, Division of Toledo Scale Corporation, Toledo 12, Ohio.

(Toledo Scale Co. of Canada, Ltd., Windsor, Ont.)

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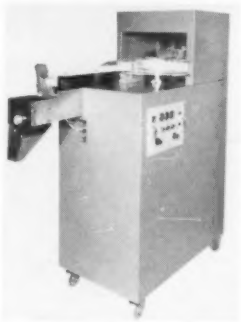
Headquarters for Weighing Systems

—filling, closing, or conveying, according to the producer. Also, the speed of the unit may be coordinated with that of other equipment. For more information write: Ampoule Machine Co., Dept. PE, 38-09 24th St., Long Island City 1, N.Y., or *circle number on card.*

15—Electronic Counter

Now available is a new single-channel universal counting machine which is designed primarily for the



food, drug, and candy industries. Counts range from 10 to 144 items/package. Change-over in 60 sec. without change parts is one advantage claimed for machine and it may be combined with various cartoning or heat-sealing packaging machines making it possible to count, package, and imprint all in one automatic operation. For more information write: Delta Engineering Corp., Dept. PE, 126 W. Emerson St., Melrose 76, Mass., or *circle number on card.*

16—Environment Test Rooms

A new line of walk-in environmental rooms has been introduced. The two temperature ranges of the units

are: ambient (room temperatures) to 140°F. and 0° to 140°F. and accuracy is maintained within plus-minus 1°F. Available in a number of stock sizes, a feature of the test room is the plenum chamber construction which eliminates all interior ducts and louvres. Standard measurements are 6x6 ft., 6x8 ft., 6x10 ft., and 6x12 ft. with an inside working height of 7 ft. All models have a 12x12 in. viewing window. Constructed of aluminum in panel form, they are

Dehydrated Adhesive

Minute Maid Corp. of Orlando, Florida, uses dehydrated Aqua-Flakes® for high speed case sealing. Frozen juice is about 15° below zero. Cases are quickly put in sub-zero storage. A real test of adhesive power!

REDUCES CASE SEALING COSTS

Aqua-Flakes are high quality liquid glue that has been dehydrated. They give lowest possible cost wherever volume is large. Only the water has been removed. Only the water has to be replaced. Simply by mixing the flakes into water.

Aqua-Flakes eliminate the problems of old-fashioned cold water solubles and cookup dextrines. No lumping. No changing characteristics due to heating, cooking, storing. No evaporation and bodying up. No wasted batches.

Aqua-Flakes film smoothly. Tack fast. Give excellent coverage. They are used in combining, laminating, heading and wrapping, tube winding, etc. Contact your nearest National office for information.

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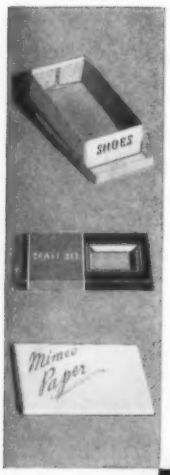
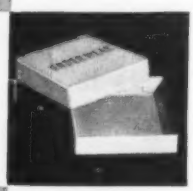
UNIVERSAL
BRIGHTWOOD
BOX MACHINE



QUALITY boxes at lowest cost

In one automatic operation flat printed blanks become perfectly squared, solidly glued boxes for shoes, underwear, corsets, games, candy, etc. — boxes with turned-over ends and finished edges all around, made from double-walled or laminated blanks. Regular glued-end single wall boxes may also be made. A very wide size range can be produced on the one machine.

Write **US** for complete information.



PACKAGING MACHINERY MANUFACTURERS INSTITUTE PMMI MEMBER

U. S. AUTOMATIC BOX MACHINERY CO., INC.

122 ARBORETUM ROAD, ROSLINDALE, BOSTON 31, MASS.
Branch Offices: New York • Chicago
James C. Hale Co., Los Angeles, San Francisco • R. S. Gold, Toronto

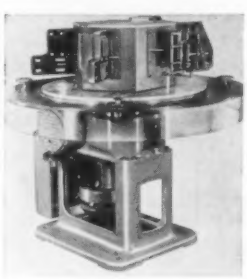
shipped knocked down for ease of handling and can be quickly assembled. For more information write: Labline, Inc., Dept. PE, 3070 W. Grand Ave., Chicago 22, Ill., or *circle number on card.*

17—Marking Attachment

Up to 250,000 markings without adding ink is claimed for the Rolacoder conveyor-line case, carton, and can marking attachment equipped with a new type of inker. A replaceable ink-impregnated roller applies a thin film of ink to the rubber type in the marking attachment after each impression is applied. The ink roller is made of Porelon, a micro-porous plastic, which is simply discarded and replaced with a fresh roller when it runs dry. For more information write: Adolph Gottscho, Inc., Dept. PE, Hillside 5, N.J., or *circle number on card.*

18—Multi-Purpose Packager

Designed for automatically packaging small hardware items, kits, or small assemblies, a standard ma-



chine is being manufactured to which the user adds machine components designed to pick up its particular item from a feeder and place it in a container. Components are interchangeable for various items so that automatic assembly or packaging of small production runs can be easily and quickly done, the maker says. Product to be packaged is received from automatic feeders at the six placing stations. Each station is furnished with horizontal and vertical work motions and serves two package positions to double the production rate of the machine which operates at 60 cycles/min. For more information write: Ferguson Machine Corp., Dept. PE, 7818 Maplewood Industrial Ct., St. Louis 17, Mo., *or circle number on card.*

19—Plastic Tubing

Thin, rigid plastic tubing is available in a variety of shapes including round, flat, multisided, or asymmetrical and various colors and tints in addition to crystal clear tubing. It is supplied in specified precut lengths or in random 6-ft. lengths with wall thicknesses from 0.010 in. and inside diameters from 1/16 to

over 3 in. For more information write: Anchor Plastics Co., Inc., Dept. PE, 36-36 36th St., Long Island City 6, N.Y., or *circle number on card.*

20—Case Opener-Packer

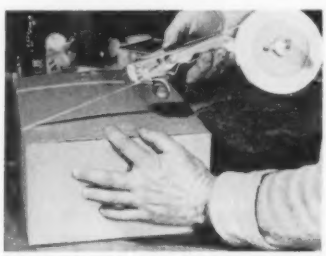
Production capacity up to 25 cases/min. is said to be possible with this new case opener, positioner, and packer that is fully automatic for packing rectangular cartons or cans. The machine handles stapled, glued, or stitched cartons. The producer says it does not require special shipping cases or tolerances, will run standard mill shipments of corrugated cartons, and features automatic accumulations of a wide variety of carton loading patterns. For more information write: A-B-C Packaging Machine Corp., Dept. PE, Tarpon Springs, Fla., or *circle number on card.*

21—Compression Tester

A device for measuring the resistance of corrugated and solid fibreboard to edgewise compression (the General Electric column crush test) enables the user to predict the probable crushing resistance of finished containers under warehouse stacking conditions. The unit consists of a compression testing machine and the associated parts for preparing and gripping the test specimen. Test specimen is cut on special cutting template and knife to 4x1x1 in., parallel to corrugations unless otherwise specified. Maximum load required to cause collapse of a section is recorded as test result. For more information write: Testing Machines Inc., Dept. PE, 72 Jericho Turnpike, Mineola, L.I., N.Y., or *circle number on card.*

22—Tape Dispenser

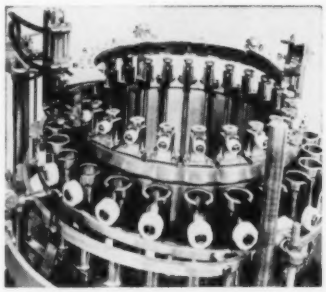
The new Time Saver is a strapping tape dispenser that is light in weight and portable. Two features are the



simple tension adjustment that provides the exact tension needed for a particular application and a trigger-action cutter which permits cutting off the exact length of tape needed. The dispenser is intended for use with Mystik brand No. 6497 Super Flextron filament reinforced strapping tape. For more information write: Mystik Adhesive Products, Inc., Dept. PE, 2635 N. Kildare Ave., Chicago 39, Ill., or *circle number on card.*

23—Magnetic Valve Control

Development of a magnetic monitor that provides positive control of valve action in high-speed, contain-



er-filling operations has been announced. Designed for use on the company's Votator rotary piston fillers, the device prevents jammed valves and consists of a battery of magnets positioned over the valves. With a container in the filling cycle, the action of the continuous magnetic field assures that the proper valve is opened fully and held open until the piston filling stroke is completed, reports the maker. For more information write: Girdler Process Equipment Div., Chemetron Corp., Dept. PE, Louisville 1, Ky., or *circle number on card.*

24—Outsert Applicator

Automatic application of Outsert folders to packages at rates up to 300/min. is possible with the new Model B labeler. Hot adhesive wax is dropped onto the container area and the folder is placed on the wax spot. A continuous conveyor chain, integrated with an existing packaging line, carries containers ahead of spaced pins and passes them under two stations for application of wax and folders. Accuracy of placement is within a tolerance of plus or minus 1/32 in., says the manufacturer. For more information write: Outserts Inc., Div. of Eureka Specialty Printing Co., Dept. PE, Scranton 9, Pa. or *circle number on card.*

25—Pouch Bag Printer

Filled pouch bags moving on a conveyor belt through a band sealer can be imprinted with control data or decorative designs above the heat seal by Model No. 100. The self-contained unit requires no operator attention except for replacement of the used rolls of transfer tape. Superior roll leaf, used with this machine, is available in any color. For more information write: Superior Roll Leaf Manufacturers, Inc., Dept. PE, No. 1 Newark St., Hoboken, N.J., or *circle number on card.*

26—Container Tester

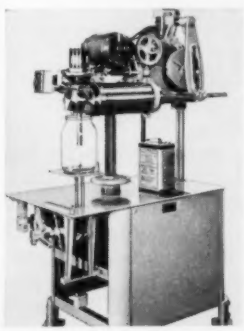
A testing device for glass, metal, or plastic containers has been designed to prevent rejection of filled units because of container leakage. Mounted on any conveyorized line, a vacuum mechanism grasps and lifts an unfilled container which, if perfect, is raised over a gap in the conveyor by the mechanism and placed for entry into the filler. If bottle is not air-tight, it falls through the gap in the conveyor into a receptacle. Unit will handle container sizes ranging from fractional ounces through gallons and can achieve speeds of up to 300 containers/min., according to the manufacturer. For more information write: MRM Co., Inc., Dept. PE, 191 Berry St., Brooklyn, N.Y., or *circle number on card.*

27—Bench Scale

A new line of platform-type bench scales for heavy duty, general purpose weighing operations is now available. Type 9600 scales are designed to provide continued accuracy under conditions of prolonged industrial usage, according to the manufacturer. The four different capacities are: 50 lb. with 1-oz. graduations, 100 lb. with 2-oz. graduations, 200 lb. with 4-oz. graduations, and 300 lb. with 8-oz. graduations. For more information write: The Exact Weight Scale Co., Dept. PE, 912 W. Fifth Ave., Columbus 8, Ohio, or *circle number on card.*

28—Bottom Filler

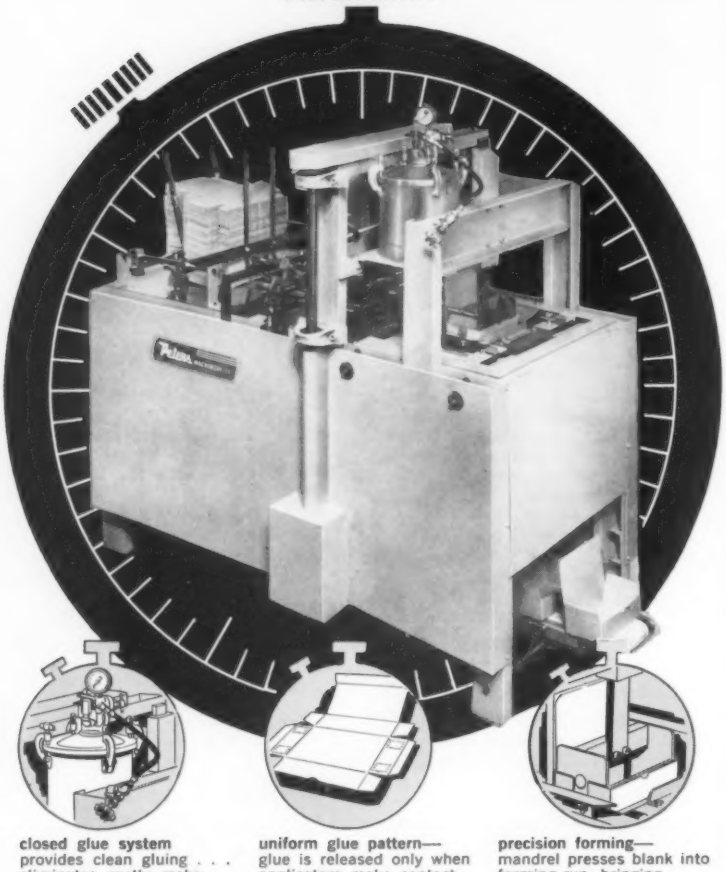
Designed to meet the problems of bottom filling of viscous products in plants with moderate production



or quick changeover requirements is this adaptation of Elgin's hand-feed, single-valve filler machine. It will accommodate all glass and F-style cans up to 1 gal. and is comprised of a 3-in. pipe feed, a 1-gal. cylinder, and a piston with a fine-fill attachment on an automatic lift table. Unit requires 24x36 in. of floor space. For more information write: Elgin Mfg. Co., Dept. PE, 200 Brook St., Elgin 1, Ill., or *circle number on card.*

(Turn page)

Cartons and Trays 70 PER MINUTE!



closed glue system provides clean gluing . . . eliminates costly make-ready and clean-up.

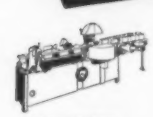
uniform glue pattern— glue is released only when applicators make contact with carton or tray blank.

precision forming— mandrel presses blank into forming run, bringing flaps into bonding contact.

Specially designed for low initial cost . . . heavy duty operation . . . moderate speeds . . . and economy of operation! New closed glue system permits immediate operation without make-ready waste . . . eliminates costly clean-up. Forms and glues a wide range of carton and tray sizes for packaging all types of products. Remember, **glued** cartons cost less for material, shipping and storage . . . and eliminate costly set-up labor. **Peters Model PG.**

Ask for a demonstration or write for descriptive folder

Peters MACHINERY COMPANY
4700 Ravenswood Ave., Chicago 40, Ill.



carton folding and closing machines

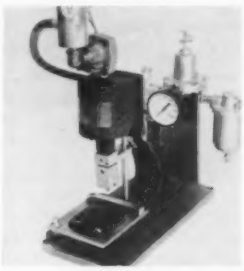
high-speed carton and tray forming machines

carton forming and lining machines

cellophane sheeting and stacking machines

29—Code Marker

A bench-model, pneumatic code marker has interchangeable die holder and fixed holder for product



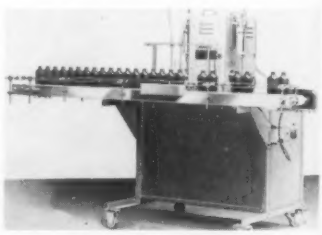
being marked. The holder permits use of a form or template for exact positioning of code when required. The device marks plastic, wood, metal, and fiber products. Size is approximately 6x12x10 in. For more information write: The Acromark Co., Dept. PE, 471 Morrell St., Elizabeth, N.J., or *circle number on card.*

30—Multi-Pack Cartoner

A line of four automatic multiple-packaging machines and one manual model is being marketed for producing multi-packs of cans and non-returnable bottles. These Jak-Et-Pak cartoners have individual capacities from 17 to 180 packs/min. Automatic machines can be equipped with a partitioning device. For more information write: Boxboard and Folding Carton Div., Continental Can Co., Dept. PE, 530 Fifth Ave., New York 36, N.Y., or *circle number on card.*

31—Liquid Filler

The new Filamatic automatic liquid filling machine features an improved indexing and bottle positioning



mechanism that centers each container precisely under the filling nozzles. The unit is portable and incorporates a no-container, no-fill mechanism. It is available with two or four spouts to provide a filling rate adjustable from 0 to 60 or 0 to 120 fills/min. Interchangeable pump assemblies provide a filling range from 1/30 oz. to 8 oz. For more information write: National Instrument Co., Dept. PE, 2701 Rockwood Ave., Baltimore 15, Md., or *circle number on card.* *(End)*

How a Plastic-pipe Maker Solved a Shipping Problem

With Low-Cost J-M Dutch Brand Strapping Tape

* To save space when shipping, plastic pipe must be coiled into rolls of the smallest diameter possible. Such rolls have a tendency to spring-out and uncoil, especially during handling, but J-M Dutch Brand No. 400 Strapping Tape solved this troublesome problem simply . . . and with new dollar-savings!

Scores of glass strands in the vinyl backing of Dutch Brand No. 400 Strapping Tape give it exceptional tensile strength. And it's pressure-sensitive—adheres instantly, holds tenaciously. Thus, one quick wrap of No. 400 at four positions around the roll binds the coiled pipe securely. Rolls can be dropped on a warehouse floor, thrown into truck beds, compressed under weight, subjected to weather changes . . . endure repeated punishment without releasing or uncoiling. Now binding time takes only seconds without the sharp-edged hazard to pipe products or personnel that often results in slower handling.

There are many ways to build an economical shipping program around Dutch Brand No. 400 Strapping Tape. Write for the J-M Dutch Brand Strapping Tape Booklet. It's filled with ideas, ideas that may help you solve one of your shipping problems.

JOHNS-MANVILLE DUTCH BRAND DIVISION
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101—Aerosols

A newsletter, "Pressure Gauge," is being published periodically to report on general happenings in the aerosol industry with comments on both the technical and marketing aspects of the field. For more information write: Aerosol Techniques, Inc., Dept. PE, 111 Silliman Ave., Bridgeport 5, Conn., or **circle number on card.**

102—Bag Packer

Model AF Bagpaker weighs, fills, settles, and closes a 100-lb. bag every 2½ sec., a recently published brochure states. Descriptions of other machinery for packaging in multiwall bags is also given. For more information write: International Paper Co., Dept. PE, 220 E. 42nd St., New York 17, N.Y., or **circle number on card.**

103—Ultrasonic Sensing

Catalog 4-1 is available on Sonac, a system for sensing, measuring, and switching by using high-frequency sound waves that are not affected by dust, steam, smoke, etc. Device can be used for automatic counting, package routing, fill control, web-break detection, and others. For more information write: Delavan Mfg. Co., Dept. PE, West Des Moines, Iowa, or **circle number on card.**

104—Heat-Seal Packer

Model 50A Packmaster is described in a circular. Unit will form packages ranging in size from 2 to 8 in. wide and 2 to 16 in. long from heat-sealable foils, films, or paper. Can be set up for either manual or automatic operation. For more information write: Sundstrand-American Broach Div., Sundstrand Corp., Dept. PE, Ann Arbor, Mich., or **circle number on card.**

105—Cellulose Bander

The automatic Cellubander is described in a new folder. Four basic models operate at speeds from 25 to 225 containers/min., depending on whether gallons or vials are being banded with cellulose. For more information write: John Burton Machine Corp., Dept. PE, 1600 West St., Concord, Cal., or **circle number on card.**

106—Polypropylene

A new technical booklet has been released on Pro-fax polypropylene. Physical characteristics, chemical resistance, and fabrication information is given and supplemented with tables, charts, and photos. A bibliography of information on polypropylene is included describing the various types of this material. For more information write: Hercules Powder Co., Dept. PE, Cellulose Products Dept., 9th and Market St., Wilmington 99, Del., or **circle number on card.**

107—Pressure-Sensitive Tape

A 2-page specification sheet (No. 710-1300) on Tapebinder pressure-sensitive tape and dispensers has been printed. It outlines applications and contains a table of physical properties covering such points as tensile strength, elongation, adhesion, and gauge. For more information write: A. J. Gerrard & Co., Dept. PE, 400 E. Touhy Ave., Des Plaines, Ill., or **circle number on card.**

108—Cartoning Equipment

Different types of products and containers are shown being cartoned or packed in cases on various types of machinery illustrated in a 19-page booklet. Both automatic and semi-automatic equipment is described. For more information write: R. A. Jones & Co., Inc., Dept. PE, P.O. Box 485, Cincinnati 1, Ohio, or **circle number on card.**

109—Plasticizers

Seven nontoxic plasticizers are described and specification properties listed in a booklet which is now available. Specific advantages in numerous applications are also told. For more information write: Monsanto Chemical Co., Organic Chemicals Div., Dept. PE, St. Louis 66, Mo., or **circle number on card.**

110—Single-Face Corrugated

A folder on the uses of single-face corrugated for both internal and external protective packaging is being offered. Also included is a table of standard stock combinations and descriptions of printed, scored, waxed, and prefabricated varieties. For more information write: Sherman Paper Products Corp., Dept. PE, Newton Upper Falls 64, Mass., or **circle number on card.**

111—Flame-Resistant Urethane

A technique for producing flame-resistant urethane foam of the polyether type is described in a new technical information bulletin. Data shows the effect of different amounts of the flame-inhibitor additive on the flammability characteristics of foam based on a polypropylene ether triol. For more information write: Mobay Chemical Co., Dept. PE, Pittsburgh 5, Pa., or **circle number on card.**

112—Temperature Controller

A 4-page brochure has been issued to describe electronic indicating temperature controllers, Series 560. It features a thermistor sensing element and covers temperature ranges from -100°F. to 600°F. For more information write: Fenwal Inc., Dept. PE, Ashland, Mass., or **circle number on card.**

113—Flexible Bags

All products of Bemis are presented in a pocket guide. Different types of bags and related packaging items including multiwall, paper, open-mesh, cotton, burlap, waterproof, and plastic. For more information write: Bemis Bro. Bag Co., Dept. PE, 601 S. 4th St., St. Louis 2, Mo., or **circle number on card.**

114—Case Former

Data sheets are available on the Caral case former, a machine for setting up shipping containers. Adaptable to most standard case packers, it requires 64 sq. ft. of floor space. Operates at 20 cases / min. For more information write: Caral Packaging Machinery Co., Dept. PE, 579 Cleveland Ave., Albany, Cal., or **circle number on card.**

115—White Fibreboard

A folder contains 6 sample swatches of the new HiYield Printkote bleach board. Made from 100-per cent virgin bleached fibre, the board is white inside and out and is recommended for printing. For more information write: West Virginia Pulp and Paper Co., Bleached Board Div., Dept. PE, 230 Park Ave., New York 17, N.Y., or **circle number on card.**

116—Flexible Packaging

An 8-page brochure has been published featuring the Compak line of flexible packaging equipment and accessories. Various models shown automatically measure, form, fill, seal, and label packages. For more information write: Hayssen Mfg. Co., Dept. PE, Sheboygan, Wis., or **circle number on card.**

117—Auger Fillers

Newly released is an 8-page folder which describes 11 standard models of automatic and semi-automatic auger filling machines. A chart lists speeds, weight ranges, and container sizes. For more information write: FMC Packaging Machinery Div., Dept. PE, 4900 Summerdale Ave., Philadelphia 24, Pa., or **circle number on card.**

118—Expanded Polystyrene

A brochure provides information and illustrations on the various applications of expanded polystyrene. Material is available in pellet form or in blocks, sheets, or logs. For more information write: Suburban Plastics Co., Inc., Dept. PE, 4041 Ridge Ave., Philadelphia 29, Pa., or **circle number on card.**

(Next page)

119—Piston Fillers

A 6-page bulletin has been issued which describes Geyer piston-type fillers for liquid, semi-liquid, and semi-solid food, chemical, and drug products. Special purpose machines are shown and specifications and production capacities are outlined. For more information write: The Filler Machine Co., Inc., Dept. PE, 10 Penn Ave., Philadelphia 11, Pa., or **circle number on card.**

120—Releasing Parchment

A file folder is being offered which contains samples and product information sheets about various grades of Patapar releasing-type vegetable parchment. Paper is specially prepared to release easily from sticky products. For more information write: Paterson Parchment Paper Co., Dept. PE, Bristol, Pa., or **circle number on card.**

121—Automatic Cartoner

Model C-10 for cartoning, lining, filling (by count), and closing is discussed in a leaflet. Using one attendant, unit operates at 60 packages/min. on such products as cough drops, candies, etc. For more information write: U.S. Automatic Box Machinery Co. Inc., Dept. PE, 18 Arboretum Rd., Roslindale, Boston, Mass., or **circle number on card.**

122—Printing On Polyethylene

The subject of printing on polyethylene film is discussed in a 15-page technical booklet recently released. Among topics covered are methods of treating film for printability, methods of printing, printing inks, field test methods, and a glossary of common terms. For more information write: U.S. Industrial Chemicals Co., Dept. PE, 99 Park Ave., New York 16, N.Y., or **circle number on card.**

123—Piston Filler

A leaflet provides a description and specifications of a 2-cylinder, non-stop piston filler. Feature of the equipment is that filling heads move with containers on conveyor during filling cycle, thus eliminating surge. For more information write: Elgin Mfg. Co., Dept. PE, 200 Brook St., Elgin, Ill., or **circle number on card.**

124—Self-Inking Rolls

Data sheet No. 100-61 tells how to imprint packed shipping cases with Packomatic Porelon automatic inkers. Unit provides up to 100,000 five-character impressions/roll and eliminates ink wells or hand-brushing of pads. For more information write: J. L. Ferguson Co., Dept. PE, P. O. Box 1226, Joliet, Ill., or **circle number on card.**

125—Polyethylene Edge Sealer

Literature is offered on the Amscomatic 100 model, a machine designed to edge seal polyethylene bags automatically on a continuous production basis. Seals up to 1,000 linear in./min. on bags of thicknesses to 0.006-in. gauge. For more information write: Amsco Packaging Machinery, Inc., Dept. PE, 31-31 48th Ave., Long Island City, N.Y., or **circle number on card.**

126—Screw Feeder

A leaflet on a high-speed screw feeder and counter is available. Unit will deliver any quantity from 3 to 2000 screws/package and will not mar screw threads or plating, the maker says. For more information write:

Just type a stencil...

and "touch" your cartons

Fastest, easiest way to address your multiple carton shipments

Weber "Touch-Stenciling" replaces labels and stencils boards. It's fast, neat and systematic

Want a quick, easy way to address shipping cartons? Then try this new Weber "Touch-Stenciling" system —means no more stencilboards, rubber stamps or label typing.

Shipping cartons, pre-printed with "Ship-To" label frames, are addressed by simply printing the customer's name and address within the frames with a Web-O-Print hand duplicator. It prints from a stencil that you can type or handwrite. Just a "touch" on the carton leaves a clear, sharp, permanent print.

With a smooth, one-hand motion 40 to 50 cartons can be addressed in a minute. After the shipment is addressed the stencil is thrown away, saving filing time and space.

Weber stencils can be prepared as part of your order-invoice writing procedure to save time and eliminate shipping errors. They can be cut as a by-product of forms typing on manual or electric typewriters, automatic accounting machines and other modern office equipment.

FREE BOOKLET TELLS SAVINGS STORY!
Write today for new booklet—How to Save Time and Money with "Assembly Line" Shipment Addressing.

WEBER MARKING SYSTEMS, INC.
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Mount Prospect, Ill.

Send me your bulletin on "Assembly Line" Addressing Systems.

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Address_____

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MARKING SYSTEMS
Sales and Service in all principal cities

WS SIFTER TOPS

Easy to apply
Just snap on

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No cap liner needed

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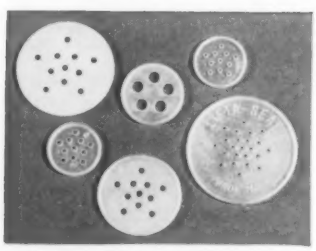

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Parkway 1-5736
St. Louis, Mo.
Parkview 7-7380
Los Angeles, Calif.
Pleasant 2-0791

WHEELING STAMPING CO.
WHEELING W. VA.
WSCO

Barnes Drill Co., Dept. PE, 814 Chestnut St., Rockford, Ill., or **circle number on card.**

127—Aerosol Products

Being offered is an illustrated, 16-page booklet on this company's aerosol activities. Topics include manufacture and development of valves, protective caps, and complete dispensers. For more information write: The Risdon Mfg. Co., Dept. PE, 5 Risdon St., Naugatuck, Conn., or **circle number on card.**

128—Seamless Cans

In product memo No. 111, light, and unbreakable metal cans of seamless, one-piece construction are illustrated and described. Charts show capacities, dimensions, packing/carton, and shipping weights for each type of can. For further information, write: George D. Ellis & Sons, Inc., Dept. PE, American & Luzerne Sts., Philadelphia 40, Pa., or **circle number.**

129—Molded Pulp Packaging

Advantages of molded pulp shapes for interior packaging are listed in a 4-page brochure. The material is especially suited for packaging fragile products. For further information, write: Keyes Fibre Co., Product Development Div., Dept. PE, Waterville, Me., or **circle number.**

130—Pressure Sensitive Labeler

A specification sheet is available on an automatic pressure-sensitive label applicator. Standard units handle labels from ¼ to 2½ in. wide at speeds of 40 to 300/min. It may be modified to handle labels up to 6 in. wide. For further information, write: Avery Label Co., Div. 179, Dept. PE, 1616 S. California Ave., Monrovia, Cal., or **circle number.**

131—Cartoning Equipment

A 6-page pamphlet shows the Tuck-O-Mat (for setting up and tucking the bottom flap of a folding carton), the Convey-O-Mat which conveys set-up cartons for filling, and an automatic carton closer. Various attachments are also depicted. For further information, write: Bivans Corp., Dept. PE, 2431 Dallas St., Los Angeles 13, Cal., or **circle number.**

132—Interior Packaging

Kimpak, a type of interior packaging material, is discussed in a 12-page booklet, KKD-38. It covers stock thicknesses and widths, use in military packaging specifications, and tests for cushioning and surface protection. For further information, write: Kimberly-Clark Corp., Dept. PE, Neenah, Wis., or **circle number.**

133—Automatic Filler

In a descriptive catalog about a high-speed automatic filler, information is given on speeds, controls, types of materials that can be handled, and other specifications. The filler handles granulars, powders, liquids, and pastes. For further information, write: Bartelt Engineering Co., Dept. PE, 1900 Harrison Ave., Rockford, Ill., or **circle number.**

134—Expandable Polystyrene

The plastics division of this company has issued pamphlet C-9-270 detailing the use of Dylite expandable polystyrene. It can be used as a shock-absorbent and water-proof pack and also as a thermal insulator. For further information, write: Koppers Co., Inc., Dept. PE, Pittsburgh 19, Pa., or **circle number.**

(Next page)

135—Rip-Cord Applicator

An attachment for box taping machines which automatically applies a rip cord to regular sealing tape as it is being applied to corrugated box flaps is described in a leaflet. For further information, write: General Corrugated Machinery Co., Inc., Dept. PE, Palisades Park 17, N.J., or **circle number.**

136—Protective Packaging

A specification sheet enumerates the various grades of Kushion-Kraft, available in sheets or rolls. Material is designed to provide surface protection and cushioning against shock. For further information, write: Jiffy Manufacturing Co., Dept. PE, 360 Florence Ave., Hillside, N.J., or **circle number.**

137—Piston Filler

Literature is being offered on the Votator piston filler. Claiming higher speed and accuracy with reduced spillage, the filler is available with from 6 to 36 stations. For further information, write: Girdler Process Equipment Div., Chemetron Corp., Dept. PE, Louisville 1, Ky., or **circle number.**

138—Machinery For Dry Products

An illustrated pamphlet deals with this company's complete line of packaging machinery for dry products. Units include a volumetric bench, in-line and rotary fillers, net weighers, and elevator-feed conveyors. For further information, write: Frazier and Son, Dept. PE, 20-01 Industrial West, Allwood, Clifton, N.J. or **circle number.**

139—Polypropylene

A preliminary technical data bulletin on polypropylene, a light, thermoplastic material. Recommendations for use of the polymer include injection molding, extrusion, film, fiber, and others. For further information, write: AviSun Corp., Dept. PE, 319 Post Rd., Marcus Hook, Pa., or **circle number.**

140—Stencil Inks

No. 58 is a 4-page illustrated bulletin showing applications of stencil inks from spray cans. It also describes Stencil-Kover which covers old stencils, labels, or any other markings. Nine colors of ink are available. For further information, write: Reynolds Inks, Inc., Dept. PE, 4536 Euclid Ave., Cleveland 3, Ohio, or **circle number.**

141—Thermal Impulse Sealer

A 12-page brochure has been published illustrating the advantages of thermal impulse heat-sealers and includes types of film sealable by this process. Models of a number of such units are pictured and dimensions given. For more information write: Vertrod Corp., Dept. PE, 2037 Utica Ave., Brooklyn 34, N.Y., or **circle number on card.**

142—Antioxidant Coating

A 12-page brochure describes the use of antioxidant-treated packaging materials to extend the shelf life of fat-containing foods. Material can be applied in an emulsified form for coating. For more information write: Eastman Chemical Products, Inc., Dept. PE, Kingsport, Tenn., or **circle number on card.**

143—Polyvinyl Resin Adhesives

A pamphlet has been released on the Seban line of polyvinyl resin adhesives. Several applications are illustrated and a list of gluing machines on which the product may be used is given. For more information write: Armour Alliance Industries, Armour & Co., Dept. PE, 16123 Armour St. NE, Alliance, Ohio, or **circle number on card.**

144—Marking Machine

A catalog which covers this company's line of marking, dating, and coding machines has been published. It provides technical data and outlines base lock types and logos, as well as custom-designed units for special applications. For more information write: The Industrial Marking Equipment Co., Dept. PE, 655 Berriman St., Brooklyn 8, N.Y., or **circle number on card.**

145—Cushioning Material

Available is a brochure on the variety of applications for Edg-Pak cushioning material. Included is a sample and cutaway diagram showing its design and performance properties. For more information write: Flex-O-Lators, Inc., Edg-Pak Div., Dept. PE, Carthage, Mo., or **circle number on card.**

146—Self-Sticking Tape

In a 44-page booklet, 80 packaging ideas using self-sticking tape are pictorially demonstrated. A list describes 37 packaging tapes, 9 of which meet government specifications. For more information write: Permacel, Dept. PE, U.S. Hwy. No. 1, New Brunswick, N.J., or **circle number on card.**

147—Cosmetics Filler

A data sheet is available on Perfektum Ampfil, model F-400X, a filler designed to handle small containers from 1 cc. to 1 oz. Applications include aerosols, cologne, creams, emulsions, lotions, etc. For more information write: Popper & Sons, Inc., Dept. PE, 300 4th Ave., New York 10, N.Y., or **circle number on card.**

148—Box Closure Methods

"Guide to Better Closures" has been prepared for users of fibreboard boxes and packages. Information is provided on hand and machine gluing, taping, stapling, and wire stitching. For more information write: Acme Steel Co., Dept. PE, 135th St. & Perry Ave., Chicago 27, Ill., or **circle number on card.**

149—Wrapping Tissues

A file folder is offered containing samples and descriptions of tissues for wrapping glassware, shirts, etc., and for high-speed packaging of products with "still-tacky" painted surfaces. For more information write: The Crystal Tissue Co., Dept. PE, Middletown, Ohio, or **circle number on card.**

150—Automatic Uncaser

Bulletin HD-200 explains and illustrates high-speed, automatic uncasing of 6- to 32-oz. bottles from all paperboard and most metal carry-home, half-depth cases. For more information write: Atkron, Inc., Dept. PE, P.O. Box 311, Cuyahoga Falls, Ohio, or **circle number on card.**

151—Silicone Coatings

A brochure, "Nothing Sticks to Paper with Syl-off Silicone Coatings," furnishes a list of manufacturers who produce end products or papers coated with this material. For more information write: Dow Corning Corp., Dept. PE, Midland, Mich., or **circle number on card.**

(Turn Page)

FAST PACKAGE SIZE CHANGEOVER FOR FROZEN FOODS

WITH CECO MODEL 40

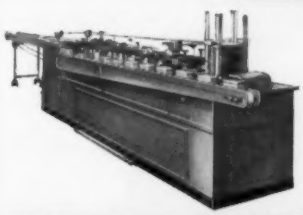
AUTOMATIC CARTONER

- *Changeover from one size to another takes only twenty minutes.*
- *Handles any size frozen food package at speeds up to 90 per minute.*

Here at relatively low cost is the perfect combination of speed and flexibility. With the product inserted manually, the Ceco Model 40 handles a glue seal end carton fully automatically from hoppering through sealing.

The Model 40 can also be had to handle heavy weight board or corrugated as well as tuck style, lock style or, a carton having one glue end and one tuck end. It is ideal for bagged products, bakery products, frozen foods, drug products, hardware, etc. For full details write for a 40 Brochure.

CECO



CONTAINER EQUIPMENT CORPORATION

78-88 LOCUST AVENUE, BLOOMFIELD 3, N. J.

152—Carton Sealing Tape

Being offered is a data sheet listing the physical characteristics and applications for Shurtape RP-25. A heavy-duty, self-sticking carton sealing tape, it offers resistance to water, abrasion, solvents, and oil. For more information write: Shuford Mills, Inc., Dept. PE, 15th St. & Highland Ave., Hickory, N.C., or **circle number on card.**

153—Machinery Catalog

Bulletin 139 is a tab-indexed booklet illustrating machines for forming and weighing, closing and wrapping combinations, air cleaning, capping, powder and liquid filling, labeling, and synchronized packaging lines. For more information write: Pneumatic Scale Corp., Ltd., Dept. PE, 77 Newport Ave., Quincy 71, Mass., or **circle number on card.**

154—VPI Paper Calculator

A booklet includes a chart for calculating requirements necessary to protect a given area with volatile corrosion inhibitor paper. Rules for handling this material are given. For more information write: Ludlow Papers, Inc., Dept. PE, Needham Heights, Mass., or **circle number on card.**

155—Carton Adhesives

Technical service bulletin No. 24, "Small Carton Sealing," discusses mechanics of carton sealing, types of carton stock, sealing machines, and a list of the company's adhesives available for this application. For more information write: Morningstar-Paisley, Inc., Dept. PE, 630 W. 51st St., New York 19, N.Y., or **circle number on card.**

156—Plastic Vials

A leaflet lists various sizes of stock plastic transparent vials produced by this company. A variety of types of containers are available in minimum quantities of 1,000 and sizes range from ½ x 2 in. to 1 x 4 in. For more information write: Lermer Plastics, Inc., Dept. PE, 540 South Ave., Garwood, N.J., or **circle number on card.**

157—Pallet Loader

A 16-page brochure has been released describing an automatic pallet loader for corrugated containers. Single or multiple (3 or 4) feed lines handling a wide variety of container and pallet sizes are discussed. For more information write: Lamson Corp., Dept. PE, 709 Lamson St., Syracuse 1, N.Y., or **circle number on card.**

158—Carton Marking

In a booklet available, 24 pages cover the following subjects: How to save on sealing cartons with gummed tape; proper inks to use for all kinds of marking; brush, roller, and spray stencilling; and data on marking packages for export. For more information write: Marsh Stencil Machine Co., Dept. PE, Belleville 34, Ill., or **circle number on card.**

159—Dry Product Equipment

An illustrated catalog describes 27 models of packaging machinery produced by this company. Equipment includes gross and net weighers, volumetric and auger fillers, coupon inserters, conveyors, and elevators. For more information write: Weigh Right Automatic Scale Co., Dept. PE, Joliet, Ill., or **circle number on card.**

160—Cellulose Sheeting

Available is a 4-page pamphlet, "Properties of Kodapak Sheet," with graphs and charts outlining the physical properties of the 3 available types of this thermoplastic, cellulose ester sheet material. For more information write: Eastman Kodak Co., Cellulose Products Div., Dept. PE, Rochester 4, N.Y., or **circle number on card.**

161—Vacuum Former

The Comet Star is a vaccum forming machine described in a bulletin being offered. Plastic sheet forming, straight drape and vacuum forming, inverted drape and vacuum reverse, and ring and punch forming are some of its applications. For more information write: Comet Industries, Dept. PE, Franklin Park, Ill., or **circle number on card.**

162—Case Former

A leaflet has been released on the CK/CO case opener-former-positioner with discharge. Operated either mechanically or pneumatically, units run at the rate of 40 or 25 cases/min. respectively. For more information write: Crompton & Knowles Packaging Corp., Dept. PE, Holyoke, Mass., or **circle number on card.**

163—Polyethylene Film

A comparative film property data sheet has been published. Poly-Eth Hi-D 2504 is compared with conventional density polyethylene for general characteristics of polyethylene films. For more information write: Spencer Chemical Co., Dept. PE, Dwight Bldg., Kansas City, Mo., or **circle number on card.**

164—Engineer's Checklist

A packaging engineer's checklist is being offered for the selection of flexible packaging materials. The list discloses 21 check points and introduces simplified explanations of factors that arise in material selection. For more information write: Riegel Paper Corp., Dept. PE, 260 Madison Ave., New York 16, N.Y., or **circle number on card.**

165—Semi-Automatic Cartoner

A folder is available on the Automax, a single-operator, cycle cartoner that feeds, expands, and places cartons in conveyor pockets. Finished packages emerge at speeds up to 45 to 50/min. For more information write: F. D. Redington Co., Dept. PE, 3022 St. Charles Rd., Bellwood, Ill., or **circle number on card.**

166—Aluminum Foil

A series of 24 laboratory reports have been compiled describing the characteristics and uses of aluminum foil as a packaging material. For more information write: Reynolds Metals Co., Dept. PE, Richmond 18, Va., or **circle number on card.**

167—Fibre Cans

Convolutely- and spirally-wound fibre cans which are available in square, oval, round, or oblong shapes appear in an 8-page catalog with specifications and illustrations. Specialty metal-end tops and 7 varieties of moisture- and grease-resistant wraps and liners are also included. For more information write: R. C. Can Co., Dept. PE, 9430 Page Ave., St. Louis 14, Mo., or **circle number on card.**

168—Humidity Controllers

A booklet is available describing a variety of humidity measurement and control systems. The 66 pages describe types of instruments, and illustrate equipment and uses for it. For more information write: Hygrodynamics, Inc., Dept. PE, 8030 Georgia Ave., Silver Spring, Md., or **circle number on card.**

169—Aluminum Closures

In a 40-page illustrated booklet, aluminum closures for a variety of bottled products are described. The publication features the entire line of closures produced by Alcoa for the food, dairy, pharmaceutical, cosmetic, and chemical industries. For more information write: Aluminum Company of America, Dept. PE, 731 Alcoa Bldg., Pittsburgh 19, Pa., or **circle number on card.** *(Next page)*

SHIPPING CONTAINER **TESTING** EQUIPMENT by Gaynes

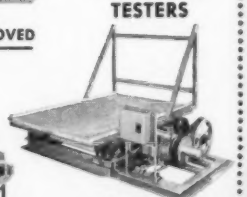
COMPRESSION TESTERS
Capacities UP TO 50,000 LBS.

DROP TESTERS
Capacities 1- 500 lbs.

NATIONAL SAFE TRANSIT APPROVED

INCLINE-IMPACT TESTERS
Capacities 600 to 6,000 lbs.

VIBRATION TESTERS



Capacities 50 to 6000 lbs.

For a complete brochure of over 70 items write to

Gaynes ENGINEERING CO. 1644 WEST FULTON STREET CHICAGO 12, ILL. • HA 1-5257

170—Urethane Foam

A folder of descriptive literature is available pertaining to a variety of applications of molded urethane foam. Stanfoam, a custom molded urethane foam, is said to provide both thermal and shock protection. For more information write: Standard Plastics, Inc., Dept. PE, Fogelsville, Pa., or **circle number on card.**

171—Conveyor Systems

Bulletin GC-59 contains 43 pages of illustrations and descriptions of materials handling equipment. Included are gravity, powered, live storage, overhead, industrial, and special-use conveyors and conveyor system accessories. For more information write: The Rapids-Standard Co., Inc., Dept. PE, Rapistan Bldg., Grand Rapids 2, Mich., or **circle number on card.**

173—Plastic-Coated Paper

Information is offered on a new polyethylene-coated packaging paper. Said to be grease-proof, nontarnishing, moisture - proof, puncture - resistant, nonscratching, and nontoxic, the paper may be printed with any process and used on standard bag machines, according to the producer. For more information write: Champion Paper and Fibre Co., Dept. PE, Hamilton, Ohio, or **circle number on card.**

174—High-Density Polyethylene

"101 Ideas in High-Density Polyethylene" is a recently published booklet showing commercial applications of this material. A tabulation is devoted to physical and chemical properties. For more information write: W. R. Grace & Co., Polymer Chemicals Div., Dept. PE, 225 Allwood Rd., Clifton, N.J., or **circle number on card.**

175—Bag Placer

Illustrations and specifications are available on the Rotomatic bag placer, model A. Unit is designed to place multiwall bags on any open-mouth bag-packing equipment at a maximum speed of 28 bags/min. For information write: Raymond Bag Corp., Dept. PE, Middletown, Ohio, or **circle number on card.**

176—Polyethylene Containers

A portfolio of illustrated specification sheets provides information on the properties and uses of molded polyethylene containers. Types described include large-capacity returnable drums, single-trip drums, and tanks. For more information write: Delaware Barrel and Drum Co., Dept. PE, Wilmington 99, Del., or **cirlce number on card.**

177—Automatic Spot Labeler

A brochure is offered on the Pony Express automatic spot labeling machine. The manufacturer claims that it handles spot labels on all containers regardless of shape at speeds up to 65 labels/min. and is economical for short runs. For more information write: New Jersey Machine Corp., Dept. PE, 16th St. & Willow Ave., Hoboken, N.J. or **circle number on card.**

178—Waterproof Tapes

Polyken waterproof tapes are presented in 2 illustrated brochures describing special applications for several types, listing its tensile strength, tear resistance, adhesion to various materials, and other performance characteristics. For more information write: The Kendall Co., Polyken Div., Dept. PE, 222 W. Adams, Chicago 6, Ill., or **circle number on card.**

179—Rust-Inhibiting Cartons

To describe Ferro-Pak, a 4-page bulletin has been released. Cartons coated with this volatile corrosion inhibitor material provide rust protection for products made of ferrous metals, effective for 2 to 5 yrs., the maker says. For more information write: Robertson Paper Box Co., Inc., Dept. PE, Rt. 163, Montville, Conn., or **circle number on card.**

180—Sheet Plastic Formers

A review of equipment for folding, creasing, beading, drawing, and forming sheet plastic is given in a folder. Machines are described, and possible shapes of fabricated plastic are illustrated. For more information write: Taber Instrument Corp., Dept. PE, 111 Goundry St., North Tonawanda, N.Y., or **circle number on card.**

181—Rotary Tablet Filler

A data sheet describes a recently introduced high-speed, fully automatic rotary tablet-filling machine. The Fil-M-Fas counts capsules or similar articles and bottles of 100 can be filled at rates of 200 bottles/min., says the manufacturer. For more information write: Turner Engineering Corp., Dept. PE, Jenkintown, Pa., or **circle number on card.**

182—Plastic Molding Material

The properties and suggested applications of Pelaspan are presented in an 8-page pamphlet. These expandable polystyrene beads are supplied for molding into lightweight, water- and heat-resistant packaging materials. For more information write: The Dow Chemical Co., Plastics Dept., Dept. PE, Midland, Mich., or **circle number on card.**

(End)

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Structural design notes for corrugated containers

Note No. 19: Drop-testing technique for boxes — Part I

By K. Q. Kellicutt,
Engineer, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Madison, Wisconsin

Introduction. Throughout this series of design notes, stiffness and compressive strength of corrugated containers have been emphasized. This has been done primarily because corrugated containers are frequently required to sustain heavy stacking loads in storage for prolonged periods of time. In these instances, the stresses to the containers are slowly applied; in fact, for short periods, they may be static.

In some other shipping hazards encountered by containers, the stresses are of short duration and are rapidly applied—as when a container falls from a stack in storage, or is dropped while being handled. One or more such relatively severe drops on a single part of the box, such as a corner or an edge, may cause the box to fail.

To insure against box failures that may result from this type of shipping and storage hazard, the users of fibreboard boxes need to specify accurately the appropriate quality of box materials required to withstand the various anticipated hazards. In specifying the material, consideration must be given to the kind and weight of load, the moisture content of the fibreboard during use, the number of failures that can be tolerated in any one shipment, and the standard laboratory test procedure that will truly reflect the merits or limitations of the container.

In this note, a drop-test procedure is discussed, and, in the next note, such things will be considered as the grade of fibreboard, weight of load in the box, and moisture content of the fibreboard as they relate to box performance.

The Drop Test

The drop test has been widely used to evaluate the resistance of a box to rough handling, because a minimum amount of equipment is needed for such tests. Furthermore, it closely simulates several of the hazards encountered in handling and shipping.

Many variations of the drop test include cycles of alternating drops primarily intended to impose rough-handling stresses on corners, edges, closures, and flat faces. Experience has shown, however, that a drop test consisting of several cycles of a variety of drops does not lend itself to statistical analysis and is not consistently reproducible. Other factors that influence reproducibility are the *kind* of solid surface on which the container is dropped during a test, and the *precise orientation* of the container before it is dropped.

It was realized some time ago that, if the drop test was to yield meaningful, reproducible results, it would need to be refined and the influencing factors just mentioned taken into account. These factors were considered by Committee D-10 of the American Society for Testing Materials in the revision of drop test procedure D 775-57T.

Dropping Surface

In order to evaluate the various kinds of dropping surfaces that might be involved in testing packages, as well as some surfaces the package might encounter in actual handling and shipping, FPL engineers studied eight surfaces by means of instrumented drop tests. The work was done as part of the laboratory's participation in the activities of Committee D-10 of ASTM.

The surfaces studied varied considerably in rigidity. They ranged from a surface of sod on clay soil to 4-in.-thick reinforced concrete floor supported on steel I-beams and steel columns in 20-ft. spans. The concrete floor gave higher impact values than the control, which consisted of a steel plate 42 in. square and 2 in. thick, embedded in a reinforced block of concrete 50 in. square and 3 ft. thick. The block was in solid ground.

The impact values for the concrete floor were about 23 per cent higher than those for the control, and the reason has not been fully established.

The most logical explanation yet evolved is that two spring-mass systems were involved. One was the instrumented test block that

was cushioned with a sponge-rubber pad on the end that contacted the dropping surface. The other spring-mass system was the concrete floor and its supports. As the drops were made in the geometric center of a 20-ft. square slab, it is reasonable to believe that the kinetic energy resulting from dropping the 60-lb. test block from a height of 24 in. was sufficient to cause some displacement of the floor and start it vibrating.

The frequency of the block system may have been close to the resonant frequency of the floor or a multiple thereof. This being true, an out-of-phase condition of the two vibrating spring-mass systems would result in additive forces and account for the high values. It is significant to point out that a dropping surface of this type, although frequently used, is not entirely satisfactory for regular tests, in that it involves a variable over which little control can be maintained. For this reason, a dropping surface of this kind should be avoided if possible.

As a result of the study, it was recommended to ASTM that a drop test surface should consist of a steel plate approximately 2 in. thick embedded in a mass of reinforced concrete having a bulk of at least 48 cu. ft., with the foundation for such a block in solid soil. The drop-test values which will be discussed in the next note were made on such a drop test surface.

Box Orientation For Dropping

In actual use, boxes are not dropped intentionally; they fall from a stack or a truck accidentally. When this happens, there is no control regarding the distance a box falls, its orientation before it falls, or the position in which it strikes a surface. However, in a laboratory, almost complete control of the boxes being tested can be maintained. Also, some of the factors previously mentioned as influencing box performance in the test can be varied.

With control of these factors, the drop test yields meaningful results that are reasonably reproducible.

Box Suspension And Orientation

After considerable experimentation with the drop test, in which both the sling system of suspension and a hinged, split-top table were tried for holding the box prior to the drop, it was thought that improvement in the drop-test method could be achieved.

The first change that was made was in the method of holding the box. Instead of the table or the sling, a method was developed by which the box could be suspended from a corner and precisely oriented prior to the drop. This was done by the use of a two-piece metal corner attached to the box. Before the box was sealed, a metal corner piece was placed in a corner of the box diagonally opposite the corner upon which the box was to be dropped.

From this inner corner piece, widely used for reinforcing trunk corners, a bolt extended through the fibreboard. After the boxes were sealed, a second metal corner piece was attached over the outside of the box corner by means of the bolt that extended from the inner corner piece. To the outside metal corner were attached three turnbuckles. These turnbuckles were used to adjust the angle of suspension of the box, and were secured to a lifting ring which, in turn, was secured to the release mechanism. The details of the suspension have been published.*

Solenoid Release Mechanism

In order to reduce the disturbance during release, an electrically operated tripping mechanism was built. In this device, the tripping action is started by activating a solenoid from a remote-control switch. After the solenoid has pulled the tripping trigger past center of the locked position, a spring, engaged through a system of levers, opens a pair of pivoted holding jaws. The action is almost instantaneous upon closing the electrical circuit to the solenoid, and, as there are no rotational forces involved and no jarring action is required for triggering, the box is literally left suspended momentarily in the air to begin an undisturbed drop.

Method Of Drop Testing

Essentially, the solenoid method of suspending and releasing can be employed with any variation of the drop test. However, the one with which we have attained the most consistency and reproducibility involves dropping each box in the lot to be tested only once. This procedure, which we developed for establishing the performance index for boxes and evaluating box material, has been included as one of the four procedures for drop tests in the ASTM tentative method of drop test for shipping containers (D 775-57T).

In using the single-drop test procedure, the first box of a lot to be tested is dropped from an arbitrary height that is chosen on the basis of board quality, weight, kind of load in the box, and past experience with similar boxes. If the first box does not fail as a result of the drop from the selected height, a second box is dropped from a greater height. If the second box fails as a result of the single drop from the greater height, an intermediate height is selected for the drop of the third box. The height of drop for each subsequent box tested depends on the results of the preceding drop test.

Thus, with a few boxes, a narrow zone of heights can be established from which some boxes of a specific lot will fail while others will not fail. The limit of the height zone depends to a large extent on the variability of the fibreboard from which the boxes are made, and the other variable factors involved in fabricating and preparing the box for test.

Some test results that have been acquired since the procedure was developed will be the subject of the next note. *(End)*

*Kellicutt, K. Q. and Landt, E. F., "New drop tests for fibreboard boxes," *Fibre Containers*, Oct., 1955.

Workable packaging spec's

(Continued from Page 36)

containers again serve as our illustrating component. Note that we have not attempted to reproduce either a general specification or any specific specifications used by our company, because the test values listed in such examples would represent only what we as a brewery demand, and would, therefore, be of limited interest. These values naturally depend upon the end use of which the container is put—and this varies greatly with the given industry.

Each Item Has Definite Purpose

Each item listed in one's general specification should have a definite purpose and the specification would be incomplete with the deletion of any one item. When a company such as ours purchases containers from multiple supply sources in large volumes, a comprehensive specification is mandatory.

The general specification enlightens your supply sources as to what *common factors* are demanded in your containers—regardless of what specific container they are asked to produce. The specific package specification gives those items applicable to only one specific container. The charts show such items which we consider important.

The above dual system of general and specific packaging specifications allows our company to purchase the best possible container at the most economical cost. In addition, it allows our customers to obtain our products in the best possible container at the most economical purchase price. We, in the package engineering department at Anheuser-Busch, feel that our efforts in obtaining a quality container through workable package specifications has had its contributing effect in making our company successful in recent years in the market places of America. We can, therefore, feel our efforts well rewarded. *(End)*

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Accurate piston fillers

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ing the consistency of the product.

Manufacturers tend to be conservative in their ratings, but any significant speed-up will affect accuracy and quality. Disregarding rated speeds also can result in a housekeeping problem as the atomized product under pressure tends to spray over the work area.

Process Variables

Rated speed, accuracy of fill, and amount of headspace above the product in the container are all dependent upon maintaining specific process conditions. The equipment manufacturer requests information as to product types, condition at the time of fill, and filling temperature before it will guarantee operating speeds. If the processor does not maintain these conditions during production runs, it will find that accuracy and quality are affected.

As the temperature of a product changes, its specific gravity will change, and, although the volume of the product filled will be accurate, the weight will vary. Increased product temperature will decrease net weight, and vice versa. In a similar manner, variations in specified viscosity will cause weight inaccuracies. A product less viscous than specified will give proper volume but decreased weight; a product more viscous, proper volume—overweight.

Another important function of proper process conditions is maintaining adequate headspace and vacuum in a capped glass jar. Temperatures below those specified can result in reduced vacuum and improper cap fit.

Piston Diameter

In general, it is desirable to use the smallest piston diameter consistent with product type and container size. The reason for selecting the smallest usable piston diameter is simply that minor inaccuracies in piston timing or length of stroke are multiplied algebraically in proportion to piston area rather than arithmetically as a function of stroke length.

This fact is illustrated in the table. The figures show that a variation in stroke length for a large piston will result in substantially more product loss than will the same variation when a small diameter piston is used. *(End)*

Lock in package contents

(Continued from Page 85)

makes unnecessary the expensive use of blocking or dunnage. With our packages in place, we have just 2 in. of space to fill. This is no problem for us or our supplier. This package has proved so effective that we require no inner protection other than the corrugated die-cut and the chipboard tubes. There is no wrapping or other protective covering around the individual rolls of stencil tissue. Our supplier simply locks these rolls in place and they reach our plant intact, all tissue ready for use. *(End)*

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What we think

Bravo: Packaging Institute plans regional meetings

One of the most refreshing chunks of news we've had in a long time is word that Packaging Institute is planning a series of regional meetings around the country. We are glad to see this Manhattan-oriented group develop an awareness of the fact that there is a vast amount of packaging going on in the rest of the country, too. We hope PI makes the most of its opportunity to take its activities to the people.

If you tarry too long in mid-Manhattan, its brisk, stimulating atmosphere is apt to envelop you in such an aura of self-sufficiency that you forget what's transpiring elsewhere. Hurrying to and from their meetings on Madison Avenue hard by Grand Central Terminal, PI's officers and directors (especially those of them who commute) have probably not much more than noticed the outbound crack trains of the New York Central.

The trouble is that watching the marker lights at the rear ends of these trains disappearing up the tangent, they forget that many of the trains "turn left" at Albany and head for the hinterland that Easterners vaguely dismiss as the West.

We have no quarrel with the East; we enjoy our associations with it and wish we could spend more time in it—from Marblehead to Savannah. But we remain impressed with the tremendous importance of packaging activity in the general area lying between the Palisades of the Hudson River and the Palisades of the Pacific.

PI must put its show on the road—and soon

As a national organization, PI is neglecting its constituency by not holding more programs in, say, Chicago, St. Louis, Kansas City—or for that matter, Omaha, Seattle, San Francisco or Los Angeles. And hand in hand with the holding of regional meetings is the basic importance of making sure the subject matter fits the particular packaging problems dominant in the locale of the meeting.

Before we take PI to task too strongly for only now realizing the importance of regional meetings, we must point out that from time to time it has broken with its long tradition of meeting in New York City. In 1954 and 1955, it held one-day regional meetings in St. Louis. As we recall, these were well attended and successful. In 1956, it took its annual forum to Cleveland, and in 1958 held the forum in Chicago. It has held and will hold professional member meetings in Chicago, and its technical committees do meet in various locations around the country.

But what has been done falls far short of meeting the needs of packaging people "somewhere west of Jersey."

Let's do more to upgrade the professional

Important as it is to hold regional meetings, we are enthused even more at the prospect of PI planning to enhance the value of professional membership. It now has 500 of these professional members, and if PI is to gather more of packaging's true professionals into its fold, it must constantly screen and refine its programs to make these meetings responsive to the needs of the real aristocrat of packaging—the professional packaging technologist.

Therefore, we urge PI to follow through on its plans to do two things at once: (1) Strike out for ever-higher standards of meetings—especially those for its professional members, and (2) seize every opportunity to carry its activities to areas of key packaging activity all over the country.

One of PI's greatest assets is its mechanism for "people to people" contact. PI's officers and directors have got to realize that many packaging people never get near Grand Central Terminal or Pennsylvania Station. It is vital that PI goes out to serve these people wherever they are, taking significant programs to them—on their home ground.

Bruce Hoffman

Editor

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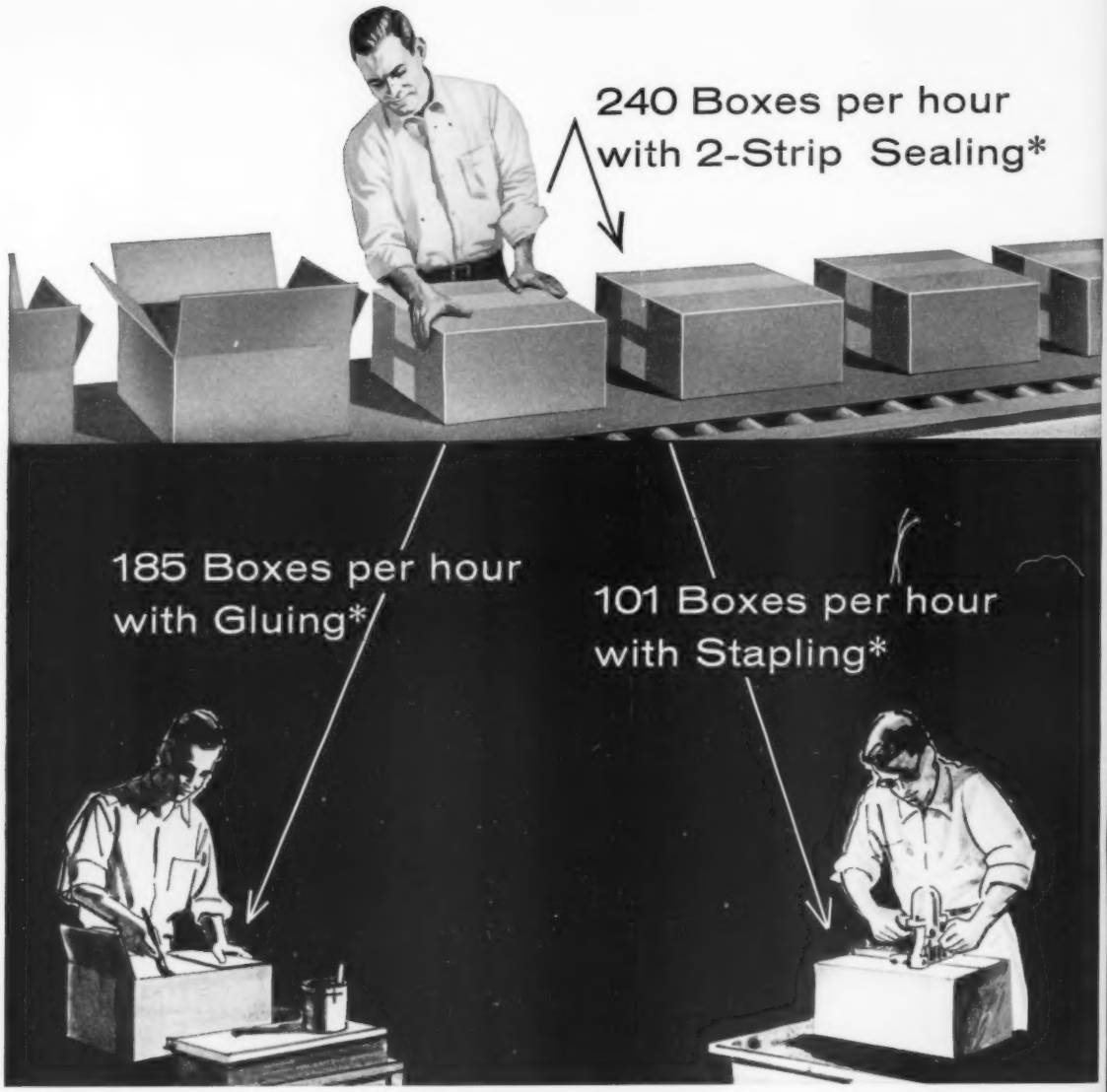

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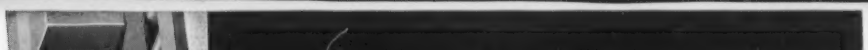
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